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ABSTRACT

This document contains the following papers on instructional design from the SITE (Society for Information Technology & Teacher Education) 2002 conference: "Faculty Guidelines for the Video Development Process" (Ronald J. Abate and Kathleen Benghiat); "Evolution of an Online Graduate Course in Educational Multimedia" (Peter Albion); "PT3 Technology Enhanced Lesson Plans for the Elementary School" (Mary Kay Bacallao and others); "Technology in the Classrooms: New Designs for Learning" (Gerald W. Burgess); "Educational Technology Learning Plans for Student Scaffolding" (Steven Coombs and Vivien Lee Looi Chng); "Assessment of Higher-Order Thinking Skills in a Web-Based Distance Learning Project" (Pat Donohue and John Hoover); "Construcivism and Designing Virtual Learning Environments" (Begona Gros); "Enhancement of Self Study of Teaching Practice Via Creation of Video Ethnographies" (R. Carl Harris); "Teacher Education from an Instructional Design Perspective" (Esther Javetz); "Using Pedagogic Scenarios To Optimize Pluri-Media Resources: The Contribution of the 'Scenistic Approach' to Designing Skills-Based Learning Tasks" (Sylvie Leleu-Merviel and others); "Infusing Technology into the Classroom: A Case Study in Interdisciplinary Collaboration" (Philip Lewis and John Hildreth); "University Faculty Needs and Desires: Support Model During Web-Basing and Web-Enhancing Courses" (Caroline M. Crawford and Kat Ley); "Web, Web-Enhanced or 80/20: Choosing the Instructional Model that Makes Sense" (Kathryn Ley and Caroline M. Crawford); "The Inquiry Learning Forum: Online Professional Development with a Community Orientation" (Julie Moore); "Realization of a Decision-Making Support System within a Whole Class" (Hiroshi Nakayama and others); "Interactive Multimedia Online Courses: Meeting Administrative, Development, and Dissemination Challenges" (CJ O'Connor); "Teacher as Instructional Designer Approach to Integrating Technology into Preservice Teacher Training" (Glenn Shepherd); "Using Web-Based Situated Learning as a Design Strategy in Teaching Elementary Economic Concepts" (Hsin-Yih Cindy Shyu); "Part of the Online Teacher's Curriculum: Designing for Collaboration and Participation in Distributed Netbased Learning" (Elsebeth Korsgaard Sorensen); "A Web Approach To Develop and Deploy an Effective Course" (Armand St.-Pierre); "The Discipline-Appropriate Use of Computers in the Classroom: Two Case Studies" (Bart Thurber and Jack Pope); "User-Centered Web Site Design in the Instructional Technology Curriculum" (Stephen P. Victor); "An

Instructional Design for Elementary Science--A Product of Current Education Reform in Taiwan" (Mei-Fun Wang); "The New Opportunities Fund 'ICT for Teachers' Initiative, in the UK and the SIfT 'Virtual Tutor' Model" (C.M. Whitehouse and others); and "Designing a Web-Based Curriculum for Middle School Students" (Timothy Youngman). Several brief summaries of conference presentations are also included. Most papers contain references. (MES)

Instructional Design (SITE 2002 Section)

INSTRUCTIONAL DESIGN

Faculty Guidelines for the Video Development Process

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Abstract: Original video materials have been employed in undergraduate and graduate teacher education courses at Cleveland State University (CSU) for the past thirteen years. These videos include K-12 teacher and student use of technological tools as well as traditional methods of instruction. This paper provides a brief rationale for implementing video materials in pre-service and in-service education courses and outlines a process for faculty to follow when they undertake production of video materials.

Introduction

Video can demonstrate how materials, strategies, and lessons can be implemented in the classroom. Historically, video has provided a mechanism for bridging theory and practice in the classroom. (Abate, Atkins, Hannah, Benghiat, & Settlage 1996). In addition, video may furnish focused learning opportunities because edited video affords a quality control mechanism not available in traditional field placements. Video used in conjunction with computers has proven effective in "anchoring" instruction in real problem situations and thus improving student comprehension of content, and problem solving abilities (The Cognition and Technology Group at Vanderbilt, 1990). The increasing connection between video and computers is making it easier for non-professionals to produce and implement video-based materials in the classroom.

Videotape is a relatively mature technology but digital video cameras, non-linear editing, and mass storage devices have only recently become sufficiently inexpensive for non-professional use. The availability of simple-to-use video production and post-production tools is making it possible for faculty to create effective video based instructional materials. However, the availability of sophisticated video editing software, though necessary, is not sufficient for creating high quality video.

Simplified Video Development Process

Thirteen years of video production at CSU have led to an understanding of the key components for the production of video by education faculty, in particular, faculty with little or no experience in video development. Video pre-production, production and post-production include both conceptual and practical/ technical steps. These steps compare favorably with the steps of the writing process (pre-writing, creating drafts, and revising and editing) and this similarity provides an understandable context for faculty new to video development.

Pre- production steps analogous to pre-writing include generating ideas, scripting and organizing. The generating ideas step tends to be intuitive to faculty since most enter the development process with a distinct idea of the story they wish to communicate via video. Scripting matches nicely with pre-writing in that it requires the creation of drafts. However, not all scripting is text based. Within the simplified video process model, faculty "script" in broad strokes 1) the events that they anticipate transpiring during video recording, 2) the order of each event, and 3) the purpose or focus of the event. Once these conceptual components are documented, the organizational step focuses on technical issues revolving around the people and equipment required by the script.

To begin organizing, a checklist is suggested to document the practical and technical pre-production issues essential for post-production success. These issues include; 1) recruiting teachers and classroom settings, 2) providing and collecting model clearance forms, and 3) visiting the classroom site. The recruitment of teachers and classrooms is straightforward as faculty members regularly begin the video development process with specific teacher candidates and classrooms identified. CSU has a standard model clearance form, and historically over 90 percent of parents have given permission for their children to participate in classroom video recording. However, arrangements for non-participants must be resolved prior to production. During the site visit, the faculty member documents the physical environment of the room including participant locations, the projected flow of the classroom activities, and the location of power, light and audio sources. From this documentation, the faculty member tests potential camera placement locations. By the conclusion of pre-production, the faculty member has a sensible plan for video production, which may be analogous to an outline or graphic organizer for a written piece.

Whereas a writer has control over temporal constraints and may develop numerous drafts, the videographer has a single opportunity to record events. As such, to provide opportunities for numerous drafts during production, the videographer must record events from multiple perspectives. Thus, a two-camera arrangement is recommended. One camera is placed in a location to capture a wide shot of classroom events. A second camera is placed outside of the line of sight of the wide camera to capture medium and close-up shots of the participants. This simple arrangement makes it possible for a single cameraperson to capture a comprehensive record of classroom activities.

To improve the opportunities for success during K-12 classroom videotaping, CSU faculty members are provided with a list of do's and don'ts. Audio quality is a major focus in this list as it is a frequently overlooked aspect of video production by novices. To compensate for the limitations of consumer quality cameras, a wireless microphone receiver can be connected to one camera. The wireless microphone is usually worn by the teacher since much of classroom audio is conveyed through or to the teacher. An alternative arrangement is to connect a directional microphone to the wireless and vary its location in the classroom according to the focus of the lesson. This method is frequently used for recording interactions of student group work.

Revision is the cornerstone of process writing and it is equally important in video post-production. Viewing footage and logging video segments remain prerequisites to editing despite advances in non-linear editing software. However, the ability to cut and paste video clips has proven to be a tremendous advancement for novice video developers. It is now possible to return to finished works and make substantive revisions. Working on one's desktop has further simplified the revision process by eliminating the need to schedule dedicated facilities. Also, desktop editing places the faculty member in direct control of the finished product. Novice faculty video producers at CSU have benefited greatly from workshops that guide them through the video production process from first idea to final product, much like a process writing workshop.

Conclusion

The technologies of digital video and non-linear editors are making it possible for faculty members with little or no experience to produce instructional video materials. Guidelines for pre-production, production, and post-production simplify the process for novices and increase the likelihood of successful video development. Videos developed via this approach may be ephemeral and not of broadcast quality, but they fill a niche for teacher educators who heretofore have been limited by developmental costs and the limited classroom video market. For guidelines on the video development process visit http://mimic.ed.csuohio.edu/video.html.

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Evolution of an Online Graduate Course in Educational Multimedia

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Abstract: Online education is relatively new and effective course designs are still emerging. A course that was originally offered successfully with small groups has evolved into two courses, which seek to achieve similar goals with greater scalability using divergent designs.

Online courses take different forms. In some cases the term may signify little more than a web site supplementing standard classes. In others all aspects of a course are handled online. As educators seek to develop online formats that work in their particular circumstances, sharing of experience with online courses is an important source of information. This paper describes the evolution of a course in interactive multimedia design offered by the University of Southern Queensland (USQ). In the USQ context, an online course is one where all interactions among teachers, learners and instructional materials occur online.

The course title is *Creating Interactive Multimedia* but it will be referred to by its code, 81530. The author has been responsible for design, development and teaching of 81530 since December, 1998. From 1997 to 1998 the course was developed and taught by others (Kirkwood & Ross, 1997; Lefoe, 1998). The first few offers of 81530 during 1997 and 1998 were to small groups ranging in number from 6 to 12.

The initial design of the course has been described as an example of a constructivist approach (Lefoe, 1998). It was presented as a simulation in which the teacher, Dr David Ross, acted as CEO of a company in which the students were members of a project team. The team was required to conceptualize, design and prototype a multimedia product for offer on the web, beginning with development of a business plan and culminating in a product launch. The course website was intended as a supplement to a textbook. Its skeleton structure included audio messages from the CEO, a skeleton structure and links to web resources. The core of the course was in the interaction among the group mediated by newsgroups, electronic mail and a weekly IRC meeting with the CEO.

The innovative design of the course attracted strong positive reactions from students and others who were exposed to it during the first couple of offers. However, the activities, which worked well with groups of up to 12 students, were not easily scalable. Moreover, the course was strongly dependent upon the personal style of the CEO. When, in the second semester of 1998, he was unavailable and enrolments rose to 30, the overall experience with an alternate leader proved less satisfactory for some students.

The author became responsible for 81530 in the following semester. Its key strength appeared to be the interaction around a common project, which served as a focus for learning. The principal deficiency appeared to be in the course materials, which were little more than a list of links to support the project work. There were concerns about the dependence of the course upon a particular personal style and its scalability if enrolments continued above 15.

Brief instructional modules were written for each core topic. Because the textbook provided most of the content, the materials were produced as a commentary on the text with links to supplementary resources. The design retained a group activity focus in assessable project work. Of three assignments, only the second, weighted at 20%, was an individual task. The first, also weighted 20%, was a WebQuest (Dodge, 1997) about tools for creation of web-based multimedia, for which students were arbitrarily assigned to groups by the course leader. The third assignment required students, individually or in self-selected groups of up to 5 or 6, to propose, design, develop and evaluate a prototype for a web-based multimedia project and report on the process. This task retained the essential group activity from previous offers but, because the entire class did not collaborate on a single project, it was expected to be more easily scalable. The report requirement provided opportunity for students to demonstrate a grasp of more than the practical skills as was appropriate for a course in a masters program. The course was offered as described, with minor adjustments reflecting accruing experience, during each of five semesters in 1999 and 2000. Enrolments in the various offers were 9, 12, 7, 37 and 13. Over that period the typical composition of the classes changed to include a greater proportion of classroom teachers rather than industry trainers or instructional designers.

An issue that emerged related to group work. All of the students were part-time, most were in full-time work, and most were enrolled through a program which had a policy of permitting individual students to delay submission of work for up to a full semester thereby making it difficult to form effective groups (McLendon & Albion, 2000). In the first minor revision, group work was made optional. Thereafter most students chose to work individually.

A second issue arose from the requirement for students to propose an original project. It seemed that indecision about their project caused some students to delay their proposal and hence completion of the course. Many students selected current work projects, which had the advantage of being realistic and relevant but were prone to restrict students' opportunity to demonstrate their learning because certain forms of media were not justifiable in terms of the real project. A further consequence was wide disparity in the standards, both in difficulty and performance, of work submitted for assessment. Ensuring comparable assessment under these conditions was very difficult.

Finally, it was apparent that students found difficulty in meeting both the practical requirements of the project and the more theoretical demands of the reflective report. Most concentrated their efforts on the practical elements, which contributed equally to the assessment and were often directly related to their employment. As a consequence it was difficult to maintain the level of theoretical treatment required to justify inclusion in a masters program.

In revising 81530 for the 2001 offer, it was decided split the course. The 81530 course continued with the practical orientation implied in the course title. A new course, 81537 *Multimedia Applications in Education*, was created to deal with the theoretical aspects of educational multimedia.

Much of the course material from 81530 was retained but the open ended project work was replaced by a series of carefully sequenced required exercises. This approach was adopted to avoid the difficulty experienced by some students in selecting a suitable project and to ensure that, so far as possible, all students would gain a similar range of basic skills in multimedia creation. Activities were structured so as to allow students to reuse content once they had created it and to complete similar activities using different tools. In one example of such a sequence, students write a haiku, set it as text in a font of their choice and convert the text to an image for display in a web page. They subsequently embellish the image, animate it and record their own voice reading the haiku mixed with music or sound effects. The sound and image(s) are then presented first as a QuickTime movie and later using Macromedia Flash. This process affords students opportunity to practice a variety of skills without needing to generate large volumes of content and to compare the capabilities of various multimedia tools. Assessment of these components is by presentation of an online portfolio based on the individual activities.

The 81537 course is distinctly different. Students are provided with a variety of readings and are asked to prepare a proposal for a paper to be delivered in an online conference. The proposals are graded and students are each required to provide anonymous peer reviews of two proposals. The reviews are also graded. Using the grading and reviews for guidance, students complete their papers, which are presented online and used as the basis of discussion over a two week conference period. As a final activity students are required to select 8 to 10 papers from the conference and write an introduction to their collection. The design is intended to ensure that students have opportunity to pursue a topic of individual interest at depth as well as a requirement to gain broad familiarity with the field.

Both 81530 and 81537 have been offered during 2001. Student evaluations reported strong satisfaction with most aspects of both courses. Issues emerging in the earlier version of 81530 appear to have been successfully addressed.

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PT3 Technology Enhanced Lesson Plans for the Elementary School

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Abstract: The concept of virtual teams is relatively new. However, a virtual team, like any other team, progress through various stages of development and is dependent upon the clarity with which performance outcomes and goals are communicated for achieving success. This presentation focuses on the analysis of the transcripts of on-line meetings of a PT3 virtual team composed of subject area team leaders and project administrators. The lessons learned from this experience helped develop an understanding of the role that clear communication and trust play in building bridges across the digital divide. Lessons from practice will include Internet Field Trips.

The St. Thomas University Plan to Bridge the Digital Divide in South Florida

A consortium of schools with St. Thomas University in Miami, Florida as the lead partner was awarded a PT3 Capacity Building grant during the first year of the PT3 program. The teacher education program at St. Thomas University serves students of many ethnic groups. It is located in an urban area with a large African American population along with immigrants from many Hispanic countries and the Caribbean.

The purpose of the initial grant was to work with area elementary schools, such as Welleby Elementary, to train the pre-service teachers at St. Thomas University and Trinity International University to use computers effectively in classroom instruction and thereby impact the diverse students in Miami-Dade County. The grant sought to train teachers who will not only teach in the inner city schools but stay in the inner city schools. By serving pre-service teachers who represent these underserved populations, the program sought to impact inner city classroom instruction.

What Has This Program Accomplished?

All of the program objectives were met in the first year and a three-year PT3 Implementation Grant was awarded the following year with more partners, including Florida Gulf Coast University and Golden Glades Elementary. The purpose of the Implementation grant changed the focus from the pre-service teachers to a team of professors, pre-service teachers, and K-6 teachers. It became apparent that, in order to effect systemic change, it was essential to train the professors. It was also essential that practicing K-6 teachers become an integral part of the process. Golden Glades Elementary, located several blocks from St. Thomas University, is a school with a student population that is completely either African American or Black American from the Caribbean. Florida Gulf Coast University is the newest Florida State University located on the West Coast of Florida and equipped with the latest technology in each college classroom.

How Did the Virtual Teams Work Together?

Subject area teams of professors, pre-service teachers, and K-6 teachers were formed. The teams focused on Math, Science, Reading/Language Arts, Social Studies, Exceptional Student Education, Curriculum, General Methods, and English as a Second Language. The focus on ESOL is important in Miami-Dade County because all teachers who are hired must also be certified to teach ESOL because of the large number of immigrant children attending school in Miami-Dade County.

During the first year, each team communicated on-line weekly. They met to discuss both successes and failures in their attempts to integrate technology into their classes. They also completed 50 hours of professional development in technology. In

the second year, they worked together as a team to write and field test technology integrated lessons. It was determined that the convergence of learning that takes place in the classroom can be written in detail through lesson planning. The professors and pre-service teachers would begin their attempts to integrate technology into the curriculum with written lesson plans. With assistance from a new partner, BEACON, which hosts an on-line database of lessons, from Bay County, Florida, the professors and pre-service teachers worked together to write lessons that are field tested in the K-6 teacher's classrooms. In this process of working together, the professors and pre-service teachers learned about the technology available in the partner schools and the classroom conditions such as class size, high stakes testing pressures, and behavior management concerns that they need to consider as they write their lessons.

How Important is Technology Support?

The participants in this program have benefited from expert technology support. The support they have received seeks to decrease reliance on outside sources by empowering the participants to do things for themselves. The effort will be sustained when the federal funding ends as the participants learn enough about technology to be self-sufficient. Instead of the technology support specialist holding the mouse while others stand amazed, the learner maintains control of the mouse. The process is similar to learning how to drive. The technology support specialist is there to assist and direct, but encourages the learner to take charge.

Why is it Important to form a Collaborative?

The fact that this grant is applied for and awarded as a collaborative can serve to strengthen the work effort and bridge the digital divide. In the first year of Implementation, a cost share crisis developed for the collaborative at St. Thomas University. Two of the original partners, Trinity International University and The 21st Century Teacher's Network, dropped out of the program; their cost share commitment was lost. St. Thomas University also had a problem with resources whereby they were not able to meet the cost share they had committed. Because the PT3 program requires a matching commitment of funds, officials at St. Thomas University temporarily suspended the grant program until documentation of cost share could be established. This was where the title of the grant, "Bridging the Digital Divide in South Florida," became the reality of what happened. Representatives from Florida Gulf Coast University were able to supply the missing cost share. Other partners responded in the same way and contributed more then they had committed in the grant application. In this way, the digital divide was bridged because those on one side of the digital divide were able to rely on their partners to help them in a time of need.

On-Line Presence

Information about our project may be viewed at: http://garnet.fgcu.edu. To view these discussions, one may register for the PT3 Fall and/or spring courses and create an identity. Once this is done, posting will be enabled for the viewer. Our website also contains information that documents our workshop activities with our partners. Our website is located at: http://coe.fgcu.edu/PT3/home.htm.

Case Study: Internet Field Trips with Dr. Joseph Furner

Internet Field Trips in Mathematics are exciting. There is a need for technology use in mathematics teaching. This is emphasized in the National Council of Teachers of Mathematics Standards. There is a wealth of websites available for teaching math concepts using the Internet. Dr. Joseph Furner from Florida Atlantic University has participated on the Math team. His role as professor and lesson author has enabled him to produce lessons that can be used by his future teachers. He will present some sample lessons he has written with websites that are available on BEACON at www.beaconlc.org

National Educational Technology Standard-Based Lesson Plans Are Written

The technology enhanced lesson plans for the Fall 2001 Semester are written and can be viewed on the BEACON database. The website for BEACON is www.beaconlc.org Selected lessons will be shown at this session.

Technology In The Classrooms: New Designs for Learning

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Abstract: New learning technology implies a "new" way of learning. Yet, the reality is that much of what is taught using technology is being done in the same "old" way. Conventional classroom instruction may require teachers and training developers to rethink their approach to instruction. New millennium teachers and school leaders must have sufficient technology expertise to integrate technology into meaningful learning paradigms. The impact of technology on teaching, instructional delivery and school reform will require knowledge of technology as a cognitive tool which when used skillfully can bring diverse learners to higher levels of academic achievement and significantly change the way learning communities are developed. This paper revisits the instructional design process as a tool for integrating technology into the classroom.

Introduction

New learning technology implies a "new" way of learning. Yet, the reality is that much of what is taught using computers and multimedia is being done in the same "old" way. Making a paradigm shift regarding learning processes is not easy (Kahn, 1993). Conventional classroom instruction may require teachers and training developers to rethink their approach to instruction. Today's educational reform is based on student-centered teaching and learning in an environment not usually supported by the more traditional uses of computer technology (Morrison & Lowther, 2002). The 21st century information technology explosion and increasing demands for accountability for teaching results, are changing the way 1) schools are responding to learners and 2) preservice teachers and school leaders are being prepared for the classroom. New millennium teachers and school leaders must have sufficient technology expertise to integrate technology into meaningful learning paradigms. The impact of technology on teaching, instructional delivery and school reform will require knowledge of technology as a cognitive tool which when used skillfully can bring diverse learners to higher levels of academic achievement and significantly change the way learning communities are developed. Learning, at all ages, should follow a model that more resembles real life (Kahn, 1993). Morrison and Kowthler (2002) state, "Using computers as tools can help teachers create a student-centered learning environment. Students create an understanding of the world that will lead to the development of knowledge." Using technology to expand both teaching and learning broadens the teacher's view as well as the student's view of the world. History may be taught in the context of events that shape the evening's news.

Learners learn by experiences in a real world, problem-oriented approach and it is on that premise that a design for functional learning for staff, faculty, and students should become reality. Schools using technology, especially those teaching technology, should lead the way in their design and implementation as a model for other schools. The design should have more to do with how students learn, and less with hardware.

What is suggested here is that student-centered learning is favored over teacher-directed learning. This does not mean the teacher is excluded from the learning process. "The primary mode of teaching switches from one of lecturing to one of facilitating student investigation. Teachers work as facilitators and tutors to help students understand the material and to provide

the necessary scaffolding (Morrison & Kowther, 2002). Further, when students are actively engaged in the learning they are more motivated and remain engaged longer than when in a teacher-directed approach. Establishing activities through the use of technology that allow for the learner to be self-directing and problem-centered increases the likelihood of the effectiveness of the learning.

Issues Confronting Reform Efforts

Teachers report little or no use of computers for instruction. Despite the growing numbers of computers in the classroom and the increase in available training, teachers are still finding it difficult to use the computer as part of their classroom delivery of content. Teachers have found their time to be very valuable and scarce (Mollison, 2001). What time is not spent on lesson planning is spent on grading, and that time not spent grading is other administrative duties. It is small wonder teachers can't find time to develop new or different instructional materials using technology they either don't have access to or don't know.

However, technology as a resource can help teachers cope with a growing paperwork load. Schools, businesses, and organizations have recognized that if they spend less time on record keeping and preparing materials, they can spend more time on productive endeavor (Roblyer, et. Al. 1996). Teachers can become more productive as they are trained in the use of technology and can gain quick access to information to help them and their students by meeting individual needs. Areas such as, word-processing, spreadsheets, databases, grade books, graphics, desktop publishing, online-communication, and test generation and scoring are just some of the few technology-based outcomes used to increase productivity.

Using technology can change the way teachers teach. Students need mentors with whom they can have effective dialogue. Approaches to constructive knowledge are full of alternatives. At any one time an individual may not be aware of all the alternatives. A negotiated discourse can enhance the student's capability to be a divergent thinker and more creative in nature. The teacher can play this role of a mentor and manager of this dialogue. The teacher directs the individualization and metacognitive skills to help the learner through the learning process (Atkins, 1993).

Increased communications is one of the biggest changes technology offers classroom teachers. On-line communication between teacher and student, teacher and parent, teacher and teacher, and teacher and information expands the dialog necessary to be effective. Let us not forget that teaching is still a human activity. Technology can offer considerable data, considerable of bits of information, considerable of interesting ideas, but if that information cannot be shared, discussed and used, it is lost. It is through this human interaction that ideas become creative thought and creative thought becomes a new product or service for humanity.

Helping teachers use technology effectively. Instructional Technology is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and nonhuman resources to bring about more effective instruction. Having said that what contributions has technology made to teaching and learning?

One factor is that *instruction can be more standardized.* One section or one class taught by several teachers can have the same thread of knowledge by using technology.

Because of the various elements of color and motion, learning can be *more interesting.* We can go places with video that would be too costly or too dangerous for our students. Yet, they can have the same vicarious experience as being there.

Though the use of computers *learning becomes interactive.* Students can make choices and respond to those choices.

Learning time can be reduced. Much research has been done in this area. Although there still remains some questions as to specifically why time is reduced, student learn faster when using technology...and perhaps as a result the over all *quality of learning improves.* We find, for example, that teachers take care to develop high quality overhead transparencies and other materials for student use that has been fully integrated into the learning process.

Students have positive attitude toward technology. They simply like using technology. There doesn't seem to be an age restriction on these learners at all levels like using the various types of technology.

Finally, the *role of the instructor changes* from the possessor of knowledge to the facilitator of the learning environment. Teachers are free to develop instruction and to spend time with students in small groups, helping the ones who need help and enriching the ones who can absorb more.

A Conceptual Plan

According to John Hortin (1988), technology should be seen as a convenient instructional and informational delivery system... 'Technology is indefatigable, patient and objective; technology allows for individualization; and it is self-directive and interactive' (p. 217). A teacher's time is more efficiently applied through the use of technology. Technology can address the variability of learners and deliver selective, up-to-date, specialized topics. Technology today has made us reconsider instruction and identified the teacher's new role. One solution toward improving the quality of interactive courseware is to involve teachers in the development process. The solution to the confusion over which strategy to use is to develop courseware that parallels the way teachers teach. Educators need to rethink approaches that have more to do with getting students actively engaged in the learning, like simulations, where the learning grows as the students reasons through and solve each step of the puzzle.

Strategies for Planning Lessons

In planning technology-connected lessons, teachers need to keep in mind that technology is a tool that supports instruction. Teachers should view technology as a cognitive tool, which has the potential of reinforcing instructional concepts and encouraging inquiry-based learning. Technology connected lesson planning must take into account the teacher's teaching style, approach to learning, and goals for instructional outcomes.

The strategies outlined below will help teachers formulate their thinking as they consider developing technology-connected lessons:

1. Teachers should think creatively about the lesson and ways to enhance learning with the use of technology.
2. Teachers should focus on developing the critical thinking skills of students and how technology can stimulate this process.
3. Teachers should encourage students to take ownership and responsibility for their learning and how technology can encourage this independence.
4. Teachers should plan lessons that respond to the variety of ways students learn and use instructional support tools beyond the chalkboard and overhead projector.
5. Teachers should view technology as a rich resource to expand the boundaries of time and place when presenting instruction.
6. Teachers should encourage collaborative and collegial learning and use technology to support out of class interactions among students.
7. Teachers should help students learn how to learn by accessing the vast knowledge base that is accessible through computers.

These new roles require thoughtful reflection on the part of the teacher as to what is taught and how what is taught can be enhanced and supported through technology integration. How many times have you sent your students to the computer to accomplish a task and they end up playing, or becoming involved in the bells and whistles of a computer program instead of focusing on authentic learning?

A good way to overcome this is by planning for technology-connected lessons. This is an overwhelming thought for teachers who have had little experience with technology or who have had little technology training. The place to start is with the curriculum – the teacher's expertise. Technology-connected activities should be based on ideas and concepts that the teacher is teaching, with the activities being of critical importance to what students need to learn. As plans are developed, technology is used as the tool or the vehicle for acquisition, organization, evaluation and application of knowledge.

The use of technology is not an end state but an integration of instructional planning and learning strategies. Teachers should be able to conceptualize the curriculum and the connecting parts including the activities that make up the daily teaching events. This process is a systematic development process around the learning theory or integration model followed by the individual teacher. However, at the core is the focus on what the student should know and be able to do. As a result of this thinking has come the establishment of technology and teaching standards, which are only part of the story. Reiser and Dempsey (2002) define the instructional development process this way..."The instructional development process encourages teachers to align goals (or objectives), tests, and teaching and to formatively evaluate and revise their test and instructional practices (Reiser & Dempsey, 2002). Teachers are then able to integrate teaching strategies and technology that is a "best fit" for the student.

The Instructional Development Process in Brief

In reviewing an instructional development process, the focus should be on the outcomes from each step. Each outcome provides the teacher with information or a product that directly affects the classroom environment. Teachers are then in a better position to make decision about instructional strategies and the integration of technology.

Analysis - a step to determine what to teach, where to teach, and who is going to be taught. The main purpose is to find out what the learner needs and what skills and knowledges are needed to accomplish that task or assignment. Collection of prior year's test scores or a pre-test may provide this information causing an acceleration or review of course materials.

Design - the way we're going teach in groups or individually. A target population description describes the student in terms of mental and physical requirements necessary or prerequisite skills, knowledges, and attitudes. Such information gives the teacher a collective view of this group of students. Objectives are written that capture what the learner will be able to do upon completion of instruction. Test questions are written during design. To ensure that tests adequately measure the objectives they support, the performance required in the test should match the performance required in the objective.

Development - the curriculum plan and materials to carry out instruction. The development phase is as the title suggests, the point where the instructional materials are written and assembled. The first step is to prepare a syllabus. A syllabus serves as the general plan for conducting instruction in a particular course and ensures standardization of the instruction while controlling the quality of the teaching-learning activity. The syllabus will also list for the student the references, tools and equipment, and the sequence of learning. For the teacher, the syllabus helps organize and sequence the material in a single document where lesson plans, computer technology, including the use of the Internet, and instructional materials are itemized.

Implement – to teach what we say were going to teach in an environment conducive to learning. Implementation involves the actual teaching of a unit, a lesson, or a group of lessons. Although important to the evaluation phase, the actual teaching is evaluated with input back to the design or development phase, whichever is appropriate.

Evaluate - looking at what you did, how you did it, and can you improve it. Collectively each step results in producing a syllabus, lesson plans, student materials, testing materials necessary for

instruction. Evaluation is a continuous process that assesses how well course graduates are meeting the established job performance standards. The focus of evaluation is to improve the quality of instruction. It is that opportunity for the teacher to review what he or she did and make improvements for the next session.

Summary

Returning to the original theme, the integration of technology will require instructional development process with clear stated goals and objectives that give the teacher and the student clear direction in the learning. The impact of technology on teaching, instructional delivery and school reform will require knowledge of technology as a cognitive tool which when used skillfully can bring diverse learners to higher levels of academic achievement and significantly change the way learning communities are developed. As teachers apply technology, new ideas will develop and student's use of the technology grows. As students within both traditional and virtual 'classrooms' make greater use of the interactive power of computers (e.g. computer mediated communications and Internet) the boundaries between traditional education and technology-enhanced education are becoming blurred. We can see that technology continues to advance while what we are calling "traditional" instruction has yet to follow. Many classroom presentations are still in the lecture format and have not taken advantage of the available technologies. The gap will be bridged as teachers use the technology to create a student centered learning environment joined by a developmental process that clearly identifies what is to be learned and the outcomes of that learning.

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Floating with the Astronauts: Integrating Curricular Elements Through Partnerships with NASA's Educational Support Systems

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Viewing live maps of the Earth from satellites millions of miles above the earth, watching the weather formations move across the United States of America, viewing starscapes and galaxies, talking with astronauts about different missions, looking at different aspects of the planets in our galaxy. So many interesting aspects that can easily be shifted towards opportunities for information within the PreK-12 learning environment. The National Aeronautics and Space Administration (NASA) realized that the data gathering journeys through out the galaxy offered opportunities for real-world educational endeavors to PreK-12 and higher education learners. Educators could easily integrate NASA's information into useful objective-driven tools which would not only offer real-world data structures with which the learners can work, but can also enliven theoretically-driven knowledge environments and make the learner's level of understanding exponentially expand when viewed through the eyes of NASA's elite researchers and scientists. Numerous subjects within the PreK-12 curricular areas of study could be impacted by NASA's educational endeavors, such as science, mathematics, English, and is especially useful when curricular advantages pertain to cross-curricular methods of subject-specific instruction. The educational entity at NASA Johnson Space Center offers opportunities for education-related organizations to work with real-world data structures and to view live, as well as digitally videotaped, educationally relevant sources of interest. The curricular elements that educators desire are designed and developed using the desires and lesson objectives specific to the needs of the learners, with the NASA partnership designed to focus upon higher order thinking skills and real-world impact upon the learners. Examples of NASA's educational support systems and partnerships will be further delineated in the proceedings paper as well as the presentation.

Educational Technology Learning Plans for Student Scaffolding

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We all know that lesson plans are introduced to initial teachers as an initial management tool for self-scaffolding organizational learning, but little work has been done to identify what defines the critical thinking process underpinning the instructional design of Educational Technology-assisted scaffolds for individualized student learning. Our research project has investigated and developed a pedagogical protocol for the practical classroom implementation of Learning Plans as a personal task-management scaffold for student-centred learning. The teacher's role in enabling self-organized learning for large groups of students can be achieved through the deployment of Technology-based Learning Plans, which converts teacher-centered curriculum management into student-centered learning tasks suitable for application both inside and outside of the classroom. This paper briefly considers the pedagogical practice behind this innovative curriculum reform initiative in the context of a recently completed research project in Singapore.

Overview of Learning Plans as Critical Thinking Scaffold Templates

Many countries throughout the world are currently investing heavily into implementing Educational Technology policies across the elementary, high school and tertiary sectors. The general belief is that computer learning resources can be a beneficial method toward implementing a more student-centred curriculum (Coombs & Wong, 2000). Many countries in south-east Asia, including Singapore, have national educational policies for implementing both Information Technology (IT) and critical thinking into the high school curriculum. The Singapore Ministry of Education considers that one way of achieving both these targets is through the curriculum adoption of student-centred project work (Ministry of Education, Singapore, 1999). The pedagogic quality and rationale of IT project-based courseware as a learning resource to support and improve the educational National/State curriculum is thus of considerable importance. It is our contention that project work can be delivered through a critical thinking schema that we call Learning Plans (LPs). These Learning Plans can be combined with a Personal Learning Contract (Coombs & Lee Looi Chng, 2001) and used to deliver a student-centred S-o-L curriculum - see figures 1 & 2.

	What is my purpose?	What became of my purpose?	Describe essential differences
Purpose	To develop a set of thinking skills to support research for project work resolving students' habit of adopting a "cut and paste" mentality.	To expose students to hands-on experiential learning such that they can hopefully learn in the long run to adopt a natural attitude and disposition for critical thinking/problem solving.	Rather than teach critical thinking skills out of context, an immersive approach was adopted. Rather than skills, it is attitudes and dispositions that matter; this increases transfer across disciplines and more importantly real world situations.
	What actions shall I take?	**What did I do?**	**Differences**
Strategy	Exploratory conversations with principal and teachers to further assess needs. Literature review. Preliminary workshop to impart skills to students. Reflective log. Follow-up conversations with school.	Further self-reflection and conversations with stakeholders. Problem is not critical thinking skills, but the design of project work. Teachers' workshop to introduce them to PSOR and learning plans. Templates can also help teachers systematically reflect for evidences of critical thinking	Increased the degree of partnership in the AR project by giving teachers' responsibility of imparting CT attitudes to students. This gave teachers ownership of the problem. With a vested interest in improving their own classroom practice, teachers identified the objectives and strategies suited for the class.
	How shall I judge my success?	**How well did I do?**	**Differences**
Outcome	Students should ideally be able to use tools independently, read information sources more carefully, and hence increasing the quality of project reports.	Learning plans have been acknowledged as a valuable tool to impart life skills for coping with changes. Greater acceptance and enthusiasm from both management and staff. Students also enjoy the engagement in discovery learning.	Students interest in working with LPs. A tool applicable across contexts especially to aid CBL, technology rich lessons. Semi-structured interviews and questionnaires were used.
		What were the strengths?	**What improvements are needed?**
Review		Teachers self-initiating the problem solving process. Teachers function as Learning Coaches. Teachers have acquired experience in using conversational tools to facilitate the reflective practice.	More time to engage teachers in further cycles of reflection and action. To encourage teachers to integrate LPs as a tool for teaching on a regular basis.

Figure 1: Personal Learning Contract

Learning Objectives
By the end of this workshop, you should be able to:
1. List examples of evaporation.
2. Infer that when water evaporates it goes into the air as water vapour.
3. Explain how wind affects the rate of evaporation.

Tasks 1 and 2 are to be completed with your partner. Complete Task 3 individually.

TASK 1: REVIEW OF CONCEPT
Collect the resource basket from the teacher's desk and take 20 minutes to complete Task 1.

Study the photographs:
Sample A: Drying of puddles of water
Sample B: Drying of clothes
Sample C: Drying of vegetables, fruit
Sample D: Drying of our kin after bath and perspiration
Sample E: Loss of water from aquariums/ponds

Record your answers in the worksheet attached.
2. Identify what's common amongst the photographs.
3. What process has taken place?
4. Next, put a drop of rubbing alcohol on your fingertip.
5. What has taken place?
6. Write your conclusion in the space provided.

TASK 2: FACTORS AFFECTING THE RATE OF EVAPORATION
Task 2 is an activity in which you will determine how wind will affect the rate of evaporation. You have 35 minutes to complete Task 2.

1. In the basket, you will find two handkerchiefs. How are they alike?
2. Wet the two handkerchiefs completely.
3. Hang the two handkerchiefs in the classroom on the line provided by your teacher.
4. Note the time on the clock and record this in the worksheet.
5. Use a fan to blow on one of the handkerchiefs for 10 minutes.
6. At the end of ten minutes, stop the fan. Record the time in your worksheet.
7. Feel the handkerchiefs and record your observations about the wetness of the two handkerchiefs.
8. Record the time.
9. Continue blowing at the same handkerchief for another 5 minutes.
10. Feel the handkerchiefs after 5 minutes. Record your observation.

- What do you think has taken place?
- Where has the water gone?
- Why do the two handkerchiefs feel different?
- What conclusions can you make?

TASK 3 BONUS ACTIVITY: USE OF CD-ROM
1. Complete the quiz in unit 3 of the CD-ROM.
2. Record the time you took to complete the quiz and your score in the worksheet

Figure 2: Learning Plan

When LPs are combined with an online learning environment that scaffolds learner thinking, we have what Coombs refers to as a "Knowledge Elicitation System (KES)" (Coombs, 1995, 2000 & 2001) and what Jonassen (1996) describes as a "Mindtool". Critical thinking scaffolds are explained by a pedagogical process called conversational constructivism (Coombs & Smith, 1998) and is derived from a conversational pedagogy called Self-organised Learning (S-o-L) (Harri-Augstein & Thomas, 1985 & 1991). A recent action research study (Lee Looi Chng, 2001) was completed in Singapore, which investigated Learning Plans as critical thinking scaffolds (Coombs, 2000) for delivering project work in Primary Schools and concluded that:

> *"As a content-free technology, S-o-L conversational tools are easy to use and findings from the mathematics and science groups do indicate that the conversational tool of the LP is indeed easy to apply across disciplines and cultures. The easy application of S-o-L tools is based on the process of reflective learning ,,,, [which has] wide appeal, being easily adaptable to the specific needs of each user"* (page 99).

Learning Plans have been designed as a critical thinking scaffold process that can be delivered within Educational Technology supported learning environments. Such Learning Plans are designed as IT-based critical thinking scaffold templates and operate as what Coombs (2000 & 2001) refers to as a reflective learning technology. This paper seeks to explain the process of how Learning Plans operate as critical thinking scaffolds for improved student learning (Lee Looi Chng & Coombs, 2001) and argues that Educational Technology content-free templates assist in that goal. Curriculum examples similar to those exhibited in figures 1 and 2, of both paper-based and online student Learning Plans, will be shared with the conference delegates, along with other conversational tools that operate as a user-friendly reflective technology (Coombs, 2000).

Conclusion

It is from the systems-thinking psychological model of self-organized learning that we can understand how to enable the conversational *fluency* of learner self-interaction through organized schemas of reflection. These reflective schemas can be designed as technology-assisted critical thinking tools (Coombs & Smith, 1999). The S-o-L instructional design process provides criteria (Coombs, 1995) for implementing knowledge elicitation tools that operate as a reflective learning technology. In practice, this calls for the design and development of an activities-based project work curriculum that recruits online Learning Plans as Educational Technology scaffolding tools, which empowers students with S-o-L skills that ultimately lead to greater personal retention and transfer of knowledge.

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Exploring the Characteristics of Effective ICT Teaching

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Abstract

The ICT workshop reported in this paper was funded by the British Educational Communications and Technology Agency (BECTA) and was designed with a particular focus on establishing and disseminating informed guidelines for effective ICT subject teaching. The invited participants were all ICT subject teachers with experience in their field. The event provided an opportunity for subject teachers and researchers to share and explore together successful teaching strategies associated with IT and then to begin the process of identifying the characteristics of good practice.

The workshop incorporated a number of different activities including short presentations, discussion, poster sessions and a plenary. Whilst the general tone was informal, it was hoped that everyone would be able to make an active contribution and benefit from the opportunity to discuss their work with colleagues. Delegates adopted two different roles during the course of the day, acting as either 'researcher' or 'poster presenter' depending on the schedule given to each group.

As 'poster presenters' each delegate was asked to display and answer questions about an activity which they judged to be an example of effective practice in ICT subject teaching. As 'researchers' each delegate gathered data from the poster presenters using, as a starting point, a framework of questions provided by the organisers:

Activity Title:	Witness Name:
Learning outcomes intended	What are the objectives? What knowledge, understanding or skill was developed/extended?
Audience	Who are the learners? What do they know/understand already? Why would they need to do this work?
Rationale	Why was this approach or strategy chosen? Was there a particular view of how learning might take place?
Resources	What materials or resources are used?
Assessment and Evaluation	How did you or could you evaluate the results or assess the learning that has taken place?
Key Processes	What are the important characteristics or features of the activity? What has made it effective?

Invitations were sent to some 35 schools in South Cheshire, North Shropshire and Staffordshire in the English Midlands. Twenty-eight colleagues accepted the offer of a workshop place although four of these later presented apologies either immediately before or on the day of the event.

The workshop support team comprised 2 researchers/teacher educators from higher education and 2 school-based members of staff engaged in IT subject teaching and teacher training partnerships.

This paper is organised around the rationale underpinning the design of the workshop model and presents a representative selection of the outcomes. These comprise a tentative list of 'characteristics' of good practice, annotated extracts of material presented in the poster sessions and the transcribed workshop evaluations.

The Assessment of Higher-Order Thinking Skills in a Web-Based Distance Learning Project

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Abstract

The Natureshift! (NS) project investigates the impact on learning of its *Exploration* model, a constructivist, project-based learning model that delivers instruction through its web site – www.natureshift.org. The web site supports educators from formal and informal education to develop higher-order thinking skills (HOTS) in their students. In the NS model, web-based adventures serve as a hook to draw students into engagement with social studies and science concepts. Once students have explored one of the web site's five immersive learning worlds (modules) that form the core curriculum of the site, the educator initiates a related real-world experience, forming a nexus between the virtual and phenomenal world. In the final phase of the model, students produce summative projects in which they construct meaning from what they have learned and present or teach their discoveries to others. Kozma (1991) suggests that multimedia helps many students to construct knowledge based on the characteristics of the medium to incorporate symbol systems and processing capabilities understood by the learner. Initial findings reveal that *Natureshift's* web-based instruction appears to engage students in higher-order thinking skills and constructing meaningful learning from their virtual and real-world experiences. A strength cited for the NS modules (Hoover, 2001) was the strength of the links to other web sites and the sheer number of visual images made available for educators and students.

Initial Evaluation

In an initial round of evaluation, it was determined that the web site's modules were well designed visually, interactively, and pedagogically. In addition, connections between the NS model and best practices in conceptual development had been established. Finally, NS personnel had redesigned the modules to reflect expert critiques and the project's goals for perfecting the NS model and its presentation through web-based instruction. The *Exploration* learning model was also adopted as a method for training educators in the model and in the project's learning strategies. Early findings from a partner Institute and a national training Institute reveal the model's effectiveness for teaching others its constructs and theoretical base. Other findings suggest that the instrumentation designed to assess learning was useful, that training activities were successful in developing technology-based skills and pedagogical application of these skills. The latter sets of skill and knowledge components were objectively assessed (Hoover, 2001).

Measuring HOTS

In the presentation, the authors describe efforts to assess higher-order thinking skills featuring (a) objective evaluation of pedagogical skills on the part of adult participants, (b) depth-of pedagogical knowledge components (established via rubrics applied to interview data), and (c) student/end-user outcomes. The innovative feature of end-user evaluation data is that each Natureshift Partner project was assessed individually—yet in a manner that allowed data to be combined, project wide. Outcomes of the assessment data are described, as are challenges in tracking learning at least one stage removed from the project. In addition, use of web-site use and tracking data is described in detail.

Constructivism and HOTS

A number of theories that try to explain the processes associated with learning and with high order thinking have been developed. The web design and the site development of *NatureShift!* are based on principles associated

with constructivist learning and with higher order thinking skills (HOTS) more generally. A system for assessing students using the *NatureShift!* application that is consistent with principles of constructivism and with higher order thinking was developed.

Constructivist theories of learning depict concepts as systems of relations among what a learner has already mastered and new information. The degree of association among the learner's knowledge, the new information, and the learner's beliefs about the concepts vary. At times, the new information is consistent with the learner's knowledge and beliefs; at other times, the new information is markedly different from the learner's knowledge and beliefs. In constructivist theories of learning, higher order thinking is the ability to discuss and to apply concepts in a manner that is consistent with experts in the field. Rather than simply measuring the ability to recall facts and data, constructivist assessments attempt to determine not only what a student has learned but also to determine how that learning has occurred.

It is also assumed that learning is heavily based on the establishment of a context for information—the more this learning context resembles the domains where learned skills are to be expressed, the better the instructional sequence is assumed to be. In the present case, the web site(s) and classroom applications serve as frameworks for learning context.

Constructivist and HOTS assessment

Constructivist assessment requires methods for gathering data on what has been learned and also how the new learning is related to previous learning. Previous reviews of the literature (e.g., Jonassen, Beissner, & Yacci, 1993) have identified several approaches for eliciting this information; the most common approach is rating the association between a pair of words.

Developing Instruments

An alternative method was developed for assessing the student gains from the project. In summary, partners were trained at the summer workshop to develop a system for assessment of student learning tied, as closely as possible, to the information and skills reflected in the specific project developed by that partner. The following specific steps were taught to partners:

1. Develop five factual and questions about the information associated with your web-based project.
2. Develop five questions about technology aspects of the project.
3. Develop essays (one each) that elicit information about (a) higher-order thinking skills, and (b) use of technology in learning.

Initial findings are that the NS model (a) successfully results in "deep" forms of pedagogical knowledge in teachers and others trained in the model. (b) It was found that NS partners could clearly, and with a high level of sophistication, explain the connections between discovery and constructive-based theories of learning and the application of technology (including some misgivings that match extant research literature). (c) Natureshift Projects resulted in statistically significant changes in nearly all students' knowledge-level skills and in some students higher-order thinking skills (though these proved difficult to track). (d) The NS model for combining technology and constructivist approaches to HOTS is a useful one that should be easily replicable.

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Essential Instructional Design Competencies for Library Media Specialists

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The role of the library media specialist is a dynamic practice that demands versatile skills. The contemporary library media specialist has clearly defined responsibilities as teacher, instructional partner, information specialist, and program administrator (AASL and AECT, 1998). The expectations described for the role of instructional partner include assessing student, identifying content, identifying learning outcomes, designing learning tasks and assessments, and selecting appropriate resources. An analysis of the role of instructional partner and corresponding responsibilities indicates a need for a strong foundation in instructional design.

Although library media specialists describe the role as important, less than 10% indicate that they perform the role to any great extent (Pickard, 1990). Pickard suggests that one explanation for the discrepancy might be the result of differences between the theoretical construct of instructional design and the real-world applications practiced by library media specialists. This difference should influence the approach used for training library media specialists in instructional design. The need to increase meaningful applications of instructional design in the real-world practice of school library media specialists requires feedback from practitioners. The first stage of this project will include surveying regional school library media specialists to assess job-specific applications of various components of the instructional design process. Results of the survey will guide the selection of an instructional design model to match relevant components with the most common or frequently identified applications. Secondly, feedback from the survey will be used to structure the design of course activities. Integrating applications identified by practitioners into the course structure will provide a framework to guide prospective media specialists in the connection between theory and practice. Course activities will draw from feedback provided by practitioners so students will have an opportunity to apply instructional design to a project that reflects meaningful application of systems theory to the role of instructional partner. The school library media specialist must possess skills that form the basis of successful cooperative planning with teachers, often taking the lead in guiding essential decisions in the instructional plan. In order to be successful in the role of instructional partner, prospective school library media specialists must extend beyond mastery of instructional design knowledge.

Competence in this role requires the ability to perform critical assessment of an instructional problem, select appropriate components of instructional design for a given instructional situation, and identify appropriate solutions. The ability to perform these skills might be enhanced if real-world applications drive the selection of an instructional design model and the ensuing course activities.

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Constructivism And Designing Virtual Learning Environments

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Abstact: The main goal of this paper is to discuss the main contributions and limitations of constructivism in the design of virtual learning environments. Constructivism is currently a label used for many approaches and it is necessary to improve the definition and delimitation of the different theories and models arising from generic principles on learning. The greatest virtue of the constructivist approach is that it provides a complex approach, which may help to improve the education and training necessary for living in the modern world. Nevertheless, there is a lack of integration of the different proposals within the constructivist approach that enables a systemic vision of the design of learning. Designers must have time to reflect on action. In fact, the current design process should itself be a focus for study.
We will place the main problems of designing constructivist environments in four categories: content of the tasks, sequencing of the tasks, transferral and co-operation.

Introduction

One of the most important problems facing education and training today is probably that most instructive approaches do not correspond to the needs of today's children and young people or the type of society in which they live. The separation of knowledge, the communication of information, the one-directional teacher-student model, and the idea of knowledge as something static are set against a much more dynamic and complex vision of knowledge. As Morin (1999) states, today's teaching must become educational teaching; "it is not a question of communicating pure knowledge, but rather a culture that enables the understanding of our condition and helps us to live. The challenge of the whole is also the challenge of complexity (11)". However, we learn to isolate objects, separate disciplines, solve problems but not to relate to each other and integrate. It is difficult, especially for children, to learn to contextualise knowledge. School behaves in the opposite way to current social development – "it is not a place where knowledge is flexible, but rather the place in which some knowledge is transmitted and classified. The place in which knowledge becomes sedentary, gets older and becomes static" (Simone, 2001, 41). However, knowledge is the organisation and the interrelating and placing in context of information and experiences that we acquire with the passing of time.

Human cognition is complex, and is reflected in the ease with which new problems are recognised and creative solutions found to solve them. There is a great deal of discussion concerning the need to centre learning on abilities and not to worry so much about knowledge. However, it is advisable to distinguish between learning abilitics and abilities themselves. Abilities are always related to a particular part of knowledge or with a trade. In fact, they are a mixture of complex cognitive strategies, interpersonal abilities and attitudes which enable someone to show themselves to be in a specific field of knowledge or in a profession.

Contrary to what is frequently suggested, we do not believe that the problem of today's society is that it is more complex than in the past. Instead, we are realising the need to start from systemic models that enable us to have an overall view of the way society works. From this point of view, we feel that the constructivist ideas have a common feature, which is that of focussing design on the creation of complex environments permitting multiple representations and which show the completeness and complexity of learning and the construction of knowledge.

In this contribution we intend to maintain that constructivism is currently a label used for many approaches and it is necessary to improve the definition and delimitation of the different theories and models arising from generic principles on learning. The use of technology from the constructivist perspective leads to highly varied metaphors for the learner: The student as a designer, as a reflexive learner, as a member of a learning community. The greatest virtue of the constructivist approach is that it provides a complex approach, which may help to improve the education and training necessary for living in the modern world.

Constructivism: a label for many approaches.

The label *constructivism* is being increasingly used but is being applied to many different approaches. Piaget and Vygotsky are the two most important authors who started research into learning using the constructivist approach in the twentieth century. There has been a great deal of discussion regarding the differences between them, with Piaget's stance on the importance of individual learning as opposed to social learning subject to a great deal of simplification. Personally, I believe that it is an error to compare the two authors (apart from their analyses of the role of language) because their approaches are not opposing but rather complementary, and concentrate on different aspects of the same situation.

Piaget does not deny the role of the social world in the construction of knowledge, but concentrates on analysing the relationship between a person and his/her environment. For Piaget, learning takes place when the new information interacts with prior knowledge by means of an assimilation-accommodation process, the result of which is the modifying of prior patterns of knowledge or the creation of new patterns. For Piaget, learning must be significant, and only significant learning is able to modify a person's patterns. To obtain significant learning it is necessary to favour the connection between prior experiences and knowledge and new knowledge. To this model of subject-medium interaction, Vygotsky adds features that play a very important role in the learning process – the tools that mediate between interactions and the people who "accompany" the subject during the learning process.

According to Vygotsky, man's superior cognitive processes are possible thanks to constant interactions between tools, environment and symbols. In this respect, "the function of the tool is none other than that of a conductor of human influence on the object of the activity, it is externally directed and must cause changes in objects. It is a medium by means of which external human activity aspires to dominate and triumph over nature. On the other hand, the symbol changes absolutely nothing in the object of a psychological operation. It is therefore a means of internal activity that aspires to dominate itself; the symbol, is therefore internally directed. These activities differ so much from each other and that the nature of the media they use can never be the same in both cases."

The concept of appropriation is a move from a biological metaphor to a socio-historical one. Appropriation is therefore a key concept from the Vygotskian perspective inasmuch as it is used to postulate that through immersion in culturally organised activities, the child appropriates tools, instruments and symbols belonging to each society. The appropriation of socially constituted interpersonal functional systems leads to cognitive representations that the subject includes in his mental structure. The computer, taken to be a tool in the sense used by Vygotsky, introduces another totally new form of interaction with information, knowledge and with other people, different from other media so far used.

The theories of Piaget and Vygotsky have led to different approaches and uses of technology that provide us with significant advances in the field of instructive design, as can be seen in Figure 1.

Many designs have been developed, based on Piaget's point of view, taking the student as a designer as the model's starting point, and emphasising the importance of learning by discovery. Meanwhile, from the Vygotskian perspective, the student is seen as a researcher, with a great deal of importance placed on learning in context and on co-operation within the learning community.

	PIAGETIAN APPROACHES	VYGOTSKIAN APPROACHES
Metaphor for the learner	The student as a designer	The student as a researcher The student as a member of a community
Didactical approach	Learning by discovery	Learning in context Learning in co-operation
Use of technology	Microworlds Cognitive tools	Learners' articulation and expression Communication tools Shared learning
Working approaches	Constructionism: S. Papert, I. Harel, M. Resnick (Media-Lab)	Learning based on problem-solving, cases, projects Distributed cognition Situated leaning (learning communities) Collaborative learning
Teaching methods	Simulation, role-playing, games, case studies, Socratic method, guided learning, scaffolding, learning by teaching, co-operative learning, collaborative learning, learning by designing.	

Figure 1: Constructivism approaches.

Designing learning environments

In the constructivist framework, the emphasis is not on teaching, but rather on contexts or learning environments. In traditional approaches to teaching, it is the designers that take the decisions regarding what students have to learn, in what contexts they should learn, what strategies they should use to attain this knowledge and how this acquisition should be evaluated. The constructivists substitute these conceptions for a more flexible concept of learning, in which the learning process is not so pre-specified. Design is an iterative problem-solving process that should be modified according to the results obtained.

Constructivist learning environments can be defined as "a place where students can work together, helping each other, using a variety of informative instruments and resources that enable them to search for the learning objectives and activities for

solving problems." (Wilson, 1995, 27). The design of multimedia materials and use of the Internet can facilitate student-centred work. Figure 2, based on the ideas of Oliver and Hannafin (2000), presents a taxonomy of constructivist tasks and the requirements of web-based tools that can help in their development.

Constructivist Tasks	Tools to support Active Student Processing of Web-Based Resources
Plan appropriate tactics, establish personal or group goals	Action of goal manager: web-based project planning
Discuss or debate internal conceptions and receive feedback	e-mail, listservs, bulletin boards, videoconferencing
Seek and collect external information	Bookmarking, digital drop boxes, Globe Web, etc
Organise external information into internally coherent framework	Software to construct tables, charts, diagrams, timelines, concept maps, etc
Generate new information	HTML text editors, web page generators, collaborative web editing, word processors, etc
Manipulate external information and variables to test and revise internal hypotheses or models	Simulations, microworlds.

Figure 2. Taxonomy of constructivist tasks

The design of a learning environment goes far beyond the computer material itself as the entire organisation must adopt this type of approach for it to be really effective. This is clearly shown in Jonassen's conceptual model (1999: 195).

Real life situations which help to put problem solving into practice and their subsequent transferral to other real situations are significant contexts for constructivists. For this reason, they oppose the lineal presentation of information in education, as this stresses memorisation and the acquisition of knowledge and abilities in an isolated manner, which is often out of context. The constructivist alternative to memorisation and activities out of context is to place greater emphasis on learning contexts that enable knowledge to be constructed, organising the contexts with activities that are closer to the real world and which normally involve discussion groups.

Limitations and possibilities of constructivist learning environments

We can place the main problems of designing constructivist environments in four categories: content of the tasks, sequencing of the tasks, transferral and co-operation.

Content of the tasks.

As has been mentioned throughout this article, the constructivist approaches emphasise the idea that knowledge is not something that can be written in a book and transmitted to students, but rather that knowledge is something complex that must be constructed by learners, and learning based on tasks or solving important problems may be a way to reach this type of learning. However, we believe that learning environments defined as environments in which the student works on a relatively complex task provide better opportunities for learning and transferring what has been learnt to other situations. The problem, however, lies in the origin of the learning tasks. What is an authentic task? When is a task motivating? Normally, as van Merrienboer points out very clearly, constructivists substitute tasks based on the world of knowledge for those based on the world of experience or work (in the case of university teaching or in-company training).

This substitution of the contents of knowledge for the contents of experience or work causes some problems. In schools, students' learning can be highly diverse according to the particular circumstances of each group. This aspect is positive but is also dangerous in terms of the lack of overall and integrated vision that is generated. Moreover, authentic tasks in childhood are always mediated by the teacher, meaning that the limits between the children's real interests and what was previously agreed upon by the educators are unclear. From the point of view of the learning medium, it is not easy to anticipate all the tools that the learning environment will have to provide the student with so that he/she can carry out the task or solve the problem. To solve or create problems, it is necessary to have a good command of content. At times, the constructivist perspective seems to underestimate or neglect this aspect.

Sequencing of the tasks.

Another complex aspect is the design of sequences of cases or tasks. As Collins, Brown and Newman point out (1987) "the ability to produce a coherent and appropriate sequence of case studies and problems (i.e., learning tasks) is a key feature in the design of constructivist learning environments". In many cases it seems necessary to go from the simple to the complex, and on the other hand, we can find many examples where there is evidence that the exact opposite is necessary. J. Merrienboer (1999) gives a very good example of this with the case of training students in instructive design. A student cannot start by moving from the simple to the complex without reviewing and evaluating previously produced material, for example.

Transfer.

Il the constructivist theories seems to be convinced that learning in context with authentic tasks improves transferral, makes it possible to apply what has been learned in a school environment outside school, and vice versa. However, this is not an easy statement to prove and in fact we do not think it has been proved in the research into the consequences for learning of the design of multimedia and web materials. This is an extremely important aspect but one which without a doubt needs a systemic research approach that has not been used to date. In our opinion, this is still the greatest challenge of research in this field where the analytical approach is still very much used, although I consider it unsuitable for research into the effects of this type of environment. According to Reeves, research shows that students learn both with and from technologies, but "we know very little about the most effective ways to implement interactive learning. In fact, the need for long-term, intensive research and evaluation studies focused on the mission of improving teaching and learning through interactive learning technology has never been greater" (Reeves, 1999).

Co-operation.

"Collaboration" refers to the fact that a group of people work together on a task. However, much has been written about how best to define "collaborative learning". A frequent point of departure is to draw a distinction between two terms that are often used interchangeably: "collaborative" and "co-operative" learning. The main difference between these terms concerns the nature of the task being carried out and the role of the group members in achieving the task. In a collaborative learning process, two or more people are required to learn something together; what has to be learned can only be accomplished if the group works in collaboration. Therefore, the group needs to decide how to achieve the task, which procedures they will adopt, how they will go about dividing up the roles, etc. Communication and negotiation are fundamental in a collaborative learning process. In contrast, co-operative learning requires a division of tasks among group members. For instance, the teacher proposes a problem that the group needs to solve and indicates who will be responsible for obtaining references from the library, who will conduct a web search, who will report back on the findings, etc. Dillenbourg's definition is clear on the matter: "a situation is termed 'collaborative' if peers are (i) more or less at the same level and can perform the same action, (ii) have a common goal, and (iii) work together" (Dillenbourg 1999, p.9).

While classical CBL (Computer Based Learning) and most of the current multimedia are designed to support an individual process of learning, in recent years an increasing number of systems that support group learning has been produced: programs that encourage learning in collaboration, videogames to be played in a group (without any element of competition), systems that facilitate communication and negotiation, the production of materials that involve written collaboration, and so on. In a computer mediated collaborative learning situation, the level of interaction is very important. As M. Barker (1999) points out, in order to achieve real learning, grounding and appropriation have to take place.

Grounding is the name given to the interactive processes by which common ground or mutual understanding between individuals are constructed and maintained. Grounding can take place on pragmatic and semantic levels. Interacting participants need to understand each other, learn to collaborate and/or have a common understanding, common domain of the task, meaning, etc. however, reaching this level of relationship is not easy in practice.

To sum up, we feel that although the greatest virtue of the constructivist approaches is that of providing a complex approach that can help to improve the education and training necessary for living in today's society, a greater degree of integration of the different ideas which enable a systemic vision of learning environment design is preparation for a do-it-yourself theory is necessary.

We give the name of a do-it-yourself theory to the systemisation of the principles of instructive design, which are able to explain the most suitable type of designs based on different educational and training needs. Designers must have time to reflect on action. In fact, the current design process should itself be a focus for study.

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ENHANCEMENT OF SELF STUDYOF TEACHING PRACTICE VIA CREATION OF VIDEO ETHNOGRAPHIES

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Abstract: Documentation of benefits of self-study on teacher education practices has gradually emerged during the past decade. Concurrently, the development and exploration of video cases or video ethnographies has also emerged and research on their impact on teaching and learning is likewise underway. However, little attention has been given to the combination of self-study and video ethnography methodology and pedagogy. This symposium will highlight five individuals who share the common attribute of having each created a video ethnography. They will each report self-study data on their respective video ethnography CD-ROMs of how the exploration of their own and someone else's teaching using video ethnography methodology has drawn attention to and elicited questions about their own professional journey.

Perspective: Documentation of benefits of self-study on teacher education practices has gradually emerged during the past decade (e.g., Connelly & Clandinin, 1999; Whitehead, 2000; Hamilton & Pinnegar, 1998; Cole & Knowles, 1998). Concurrently, the development and exploration of video cases or video ethnographies has also emerged and research on their impact on teaching and learning is likewise underway (e.g., Harris, Pinnegar, & Chan, P. 2000; Pinnegar, Harris, & Chan, 2000; Pinnegar & Harris, 1999; Harris, 1999; Harris, 1998); Harris & Harris, 1998; Harris, 1996; Harris, 1996; Harris, 1995; Harris, 1994). However, little attention has been given to the combination of self-study and video ethnography methodology and pedagogy. This symposium will highlight five individuals who share the common attribute of having each created a video ethnography. They will each report self-study data of how the exploration of someone else's teaching using video ethnography methodology has drawn attention to and elicited questions about their own professional journey.

Video Ethnographies Defined: Video ethnographies are cases of true and actual practice. The teachers studied are not actors and neither are their students. There is no effort to sanitize the challenges of teaching nor understate the effort teaching for active learning requires. The complex performances of teaching and learning can be positioned for deep and insightful analysis. When live teaching is observed there is much that goes unnoticed because so many things are happening at once. However, with video ethnographies pre-service and in-service teachers are invited to make multiple observations and interpretations of single episode.

The platform for each case is a CD-ROM or Internet interface which allows pre-service and in-service teachers to explore and build studies of practice. The "study explorer" provides for inquiry into four studies, 36 video probes and 144 commentaries. The "study builder" enables the pre-service or in-service teacher to create an infinite number of original studies of teaching practice with commentaries from self, professional literature and other teachers. Portions of a case can be studied from the perspective of the teacher, the student, another more advanced teacher, the professional literature, etc. and their own perspective.

Teachers and students who submit to having their teaching and learning documented and analyzed have a strong voice in deciding what will be most helpful to share with other teachers and learners who want to implement active learning.

Using Video Ethnographies: Use of this technology engages users in an inquiry driven experience in studying teaching practice which will lead them to use in inquiry driven approach in their own practice. Pre-service and in-service teachers metaphorically climb inside another teacher's classroom: viewing not only the way the teacher constructs the practice but also the thinking of the teacher, students, and other professionals about practice. Using this technology requires the use of a new pedagogy of

practice, since it demands that pre-service teachers are required from the beginning of their teacher education experience to grapple with their own theories and beliefs about teaching practice through inquiry into the practice of others.

Creating Video Ethnographies: Creating a video ethnography includes choosing a master teacher, acquiring media releases, filming in the classroom, negotiating with the teacher and specialists which attributes of the classroom to study in depth, conducting interpretive interviews with the teacher, other teachers, administrators, scholars, students, parents, etc. editing the video capture, identifying relevant quotes from the professional literature, and then assembling video, audio, and text files together so they will run on either the CD-ROM or Internet platforms.

Self Study During Video Ethnography Creation: During the process of developing the video ethnographies, numerous opportunities confront the educator/producer of the video ethnography to question and reflect on his or her own professional development. The five educators featured in this symposium have installed their reflections about their own teaching in the perspectives contained in each case as they have gone through the numerous stages of creating video ethnographies of their own teaching.

Featured Educators: The five video ethnography self-study teachers and their respective video ethnography products are: 1. A Teacher Educator and Literacy Specialist (The Canda Mortenson Case: A Video Ethnography of Balanced Literacy in the First Grade); 2. A Pre-Service Teacher in an Educational Psychology Class; 3. A Teacher Educator and Physical Education Specialist (The Robyn Bretzing Case: A Video Ethnography of High School Volley Ball); 4. A Doctoral Student in Instructional Psychology and Technology (The Traits of Thinking Case: A Video Ethnography of Mandrin in Senior High School); 5. An Undergraduate Student in Elementary Education (The Mom, Dad, and Me Case: A Video Ethnography of a Pre-Service Teacher's Study of Her Parents' Teaching).

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Hand-Me-Downs: Reusing Online Courses and Building Courses for Reuse

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Colleges and universities invest heavily in the production of online courses for their virtual universities and online extensions. However, a growing number of institutions may be jeopardizing their up-front investments unwittingly. That is, in the rush to put degree programs online, too many courses are developed in haste--often by inexperienced or over-committed instructors--or developed in such a highly personal or idiosyncratic fashion that courses can be of little use to future instructors who might inherit such courses or teaching assignments.

At the very heart of a flexible and cost-effective online education system is the inheritability and reusability of course content. Yet colleges and universities with online programs have demonstrated little regard for what makes an online course inheritable and reusable. While many statewide systems, schools and universities have turned to course management systems, such as WebCT and Blackboard, in order to establish some semblance of order and consistency, what they have gained is arguably that—*some semblance*.

This presentation will position the course management system as a *means* not a *method*, and will illustrate the kinds of the problems and restrictions instructors may face when they inherit online courses. It will also address the undermining potential of such problems and restrictions: the time/labor costs involved in necessary course revisions and the ethical dilemmas of authorship and academic freedom. The proposal fits into a number of SITE topic categories, including PT3, Concepts and Procedures, Distance Education, Faculty Development, Instructional Design, and Special Needs.

Teacher Education from an Instructional Design Perspective

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Abstract: This paper is a report on the findings of the first part of a study conducted in teacher education classes and related activities. Situations and materials were recorded with audio equipment or with notes taken by the researcher. Qualitative techniques were used on the data to determine teaching methods and performance level of preservice teachers. Findings indicate that teachers see themselves mostly as affective leaders or non-specific cognitive leaders. They also do not exhibit all the skills needed to teach. Instructional design theories and procedures are suggested to enhance teacher education.

Introduction

Instructional Design and Teacher Education

The March 1994 issue of *Educational Technology* was dedicated to the relationship of instructional design and teachers' planning (Branch 1994, Driscoll et al. 1994, Earle 1994a, Earle 1994b, Garbosky 1994, Kennedy 1994, Martin 1994 and Reiser 1994). The type of instructional design described in these articles was a systematic approach (the ISD concept), but behavioral in nature.

However, the field of instructional design changed in the 1980s to adopt a cognitive learning theory and later a constructivist theory (Driscoll 1994, Ellis et al. 1993, Gagne' 1985, and Reigeluth 1983). We should investigate to see whether newer learning theories and instructional design procedures are currently taught in teacher education programs, and whether they are applied by new teachers in schools. The onset of calendar year 2002 reminds us that we are at the beginning of a new century, which is a natural point in which to pause and evaluate our profession.

The Importance of a Learning Theory and a Notion of Subject Matter Structure

Teacher planning has been traditionally focused around the concept of "activity" or "routine"(Yinger 1979). The use of activities has the advantages of providing tasks for individuals, groups, or a whole class. Behaviors are controlled and motivation and enjoyment are observed. Every lesson requires more activities, but are they tied to the learning level needed (concept learning, problem solving, etc.)? Do teachers have a strong sense of subject matter and curriculum in order to select key concepts and rules? In short, are activities "chained" to make both "learning sense" and "subject matter sense"?

People who envision a new system of education for this century (Reigeluth & Garfinkle 1992) see a different type of teacher, ("more a guide on the side than a sage on the stage" p.17). But the teaching environment is not that different from what we perceive today:

> It might be [a] traditional, discipline-oriented area such as biology, a cross-disciplinary, thematic area such as pollution or cities, an intellectual area such as philosophy, or a technical area such as automobile maintenance and repair.
>
> In all cases ...the cluster guide will be responsible for helping the student put together a program of study that represents a good progression of higher-order skills instruction. (Reigeluth & Garfinkle 1992, p. 19)

It is assumed that producing a higher-order skill level requires a preexisting stock of meaningful amounts of structures such as discipline-specific structures or other types of structures.

Becoming Teachers

Typically, certain coursework, professors, and practicing teachers are all involved in developing a person to become a teacher. Specifically, towards the end of their bachelor degree program, students take general education courses and specialized methods courses (dedicated to a subject matter). They are also assigned to schools, where a cooperating teacher provides support, and where they teach their first lessons. Supervising teachers visit these schools to evaluate these first lessons. In addition, groups of teachers-to-be get together in seminars to share these experiences.

Sometimes, throughout these different components, a theory of learning/instruction is being presented and becomes the pillar of the program (Gleason 1991).

The Study

A pilot study is currently under way at a multi-branch university that has provided a teacher education program for many years. The principal investigator is following a group of 14 preservice teachers with an audio recording machine. Four avenues of learning are being recorded and analyzed: 1) lessons given by teacher educators, 2) discussions and sharing by the prospective teachers as they help each other, 3) presentations of final projects (a three lesson unit) and 4) lessons taught by the group members in area elementary schools.

The principal investigator is looking at *relevant concepts and theories* presented to the teachers-to-be, the *type of presentation* (verbal information, practiced concepts and rules, or encouragement for transfer), and the *application of the theories* into their first lessons/presentations. Clearly, this study is focused on the cognitive aspects of learning and teaching, keeping in perspective that there are also other elements needed in an elementary school teacher's "tool box."

Once all the data is collected and analyzed, strengths and weaknesses of the teacher education program will be identified. Later, this pilot model will be expanded to additional branches, and then to other institutions.

Findings

At this stage of the study, the analysis of the Science-Methods course has been completed. The data consists of audio recordings of lessons, the principal investigator's notes, recordings of final presentations, and a recording of a relaxed interview session in a restaurant.

(Tab. 1) reveals the achievements of the preservice teachers in their final project presentation. It seems that they are still missing important tools, and therefore, their lessons sound like a list of materials and activities where there is no sequence, no strong relationship to the subject matter, and sometimes no notion of developing knowledge in the children's minds.

Strengths	Need Improvement
Materials/Technology	Lesson planning: objectives
Hands-on activity	Lesson planning: sequence
Independent activity	Unit planning
Subject matter Ideas	Subject matter structure awareness
Connection to other subject areas	Assessment
	Learning theory
	Method awareness

Table 1: Evaluating Final Projects in a Science Methods Course

(Fig. 1) presents the data analysis from when preservice teachers each answered the question: "what is teaching?" When the answer was categorized as affective, it was typically similar to the following: "I think teaching is to prepare students for the adult life, being a role model for them, teaching them how to make choices, not just academically, but in every area of their life." When the answer was categorized as cognitive non-specific, it was typically similar to the following: "I believe teaching is giving or helping students attain strategies for being lifelong learners, so they can attain anything that they want to do " When the answer was categorized as cognitive-specific it was typically similar to the following: "For me, teaching is the ability to

give children the ability to find knowledge on their own. You teach them many facts, you transfer much of your knowledge to them, but what they need after school is the ability to acquire knowledge on their own and being able to continue on."

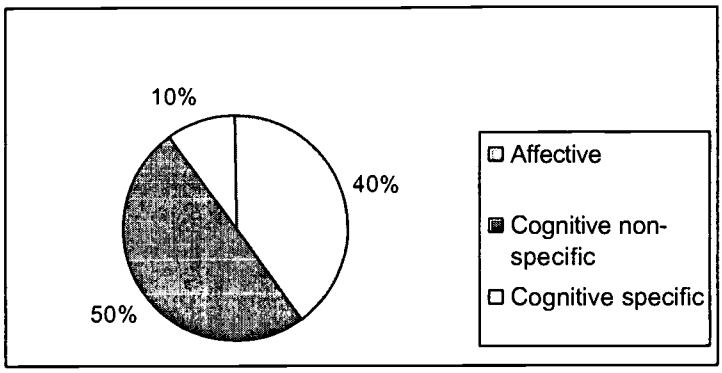

Figure 1: Preservice teachers' types of responses to "What is teaching?"

As shown from these responses, most of this group of preservice teachers does not have a theory for specific cognitive intervention.

One way to explain this level of performance by the preservice teachers is to examine the input phase. (Tab. 2) shows that the theoretical portion of the course was cut short. The instructor preferred statements (Activity 6) to well developed theories (Activity 4). The bulk of the learning was achieved via the verbal information type (Gagne', 1985). See Activity 4 and Activity 10. The feedback from the instructor signified acceptance rather than an evaluation of the level of performance (Activity 14).

The instructor's assumption was that the preservice teachers were afraid of science, so they needed "easy" assignments and direct talk about that fear (Activity 9).

One of the best activities in the Science-Methods class was Activity 12. It provided many examples of topics and supporting materials. However, examples might not be as easy to follow when concepts and principles are not provided.

Activity	Duration
1) Group experimentation and later sharing w whole class to find independent and dependent variables	long
2) Collecting a large sample of botanic items, including definition without any prior instruction	long
3) Comparison between science lab in different grade levels	short
4) Each group read about another method and presented to the class: Constructivism, expository, free discovery, guided inquiry, conceptual change, equilibrium and disequilibria	Short for each element
5) Teacher discusses and gives examples about student prior beliefs in science matters	long
6) Teacher recommends that "curriculum should be tied together" w many examples	long
7) Students were brainstorming about alternatives to the botanical project	long
8) Teacher's statement: it's the quality of the understanding rather than the quantity of information presented	short
9) Many teacher statements like: I want to expel your fears...	Short but repetitive
10) Students paraphrasing articles from sciece teaching magazines	long
11) Students work w different assessment examples	short
12) Teacher teaches the concept science-technology-society-issue through discussion and Internet browsing	long
13) Discussions about the students' field experiences	long
14) Teacher's feedback: Good job. That's wonderful. Very good	N/A

Table 2: Teaching methods in the Science-Methods class

Conclusions

The principal investigator will continue to follow the group of preservice teachers as they complete the 4th and last year of the teacher preparation program. However, even from the early data (consisting of just the Science-Methods class), it can be seen that this type of learning is not strong enough to foster a full understanding of science, to understand the learning process, to provide the professionals we need in the new century to bring children to a problem solving level, or to foster teaching for transfer (Perkins & Salomon, 1988).

The preservice teachers exhibited difficulty in coming up with an assessment piece for their units. They saw several examples during the course, but could not find one matching their situation. If provided with instructional design knowledge (e.g., concept learning, rule learning, etc.), they could have easily written objectives, come up with a method/treatment, created an assessment, looked at prior achievements and planned further teaching. A theory is required in order to drive the many elements needed for effective teaching.

The program is also theoretically mixed. The preservice teachers were briefly trained to write behavioral objectives, but the examples of assessment were of different, unrelated types. For instance, they were exposed to the method of journaling. What type of objective does this assess?

The two major elements necessary in a program are a learning/teaching theory and a subject matter understanding. These two should have been covered before the Science-Methods class (through prior coursework), as well as during this class. Thus, there should be a 'whole program' focus rather than a system of dealing with one course at a time.

Institutions can use studies such as this one not only for program evaluation, but also for quick improvement. I have already begun working with the Science-Methods teacher to improve the subject matter component in the next semester.

Teacher education may improve significantly when seriously incorporating instructional design theories and procedures. We should keep in mind that teachers are expected to perform better in the new century.

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Using Pedagogic Scenarios to Optimize Pluri-Media Resources: The Contribution of the *Scenistic Approach* to Designing Skills-Based Learning Tasks

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1. Introduction

Faced with a fast changing society, the need to develop versatile instructional materials to update the professional skills of experienced practitioners, be they those of teachers or sales assistants, has become a major necessity. Long gone are the days when the creation of such training[1] material happened within the hallowed halls of specialized educational institutions. Instead, a more client-driven approach to professional training has led many educationalists to look at how the reality of the work place (office, factory floor, classroom) and available resources, notably information technology (IT), can contribute to the learning process. It is in this context that we will outline the framework of how a series of instructional fragments for a Digital Versatile Disc (DVD)-video, *Voilà Madame*, was created by systematically harnessing the resources of pedagogues, learners and management.

The value of this project for teacher trainers and instructional material-makers lies in the possibility of transferring the operational framework of this project to other contexts where a premium is put on helping professionals in the field (e.g. classroom teachers) to be more aware of their verbal and non-verbal behaviors. This is of particular interest to those working in the fields associated with communication sciences (e.g. face-to-face interaction, verbal & nonverbal communication) and the linguistic field of pragmatics[2], for example in the teaching of English/French/etc. as a professional language.

First, in Section 2, we describe the framework for analyzing the needs of the training context and its practical implications. This is followed in Section 3, by an explanation of the five-step *Scenistic Approach* with its *diagesis*, *scenario*, *scenation*, *scenic* and *setting up the situation* phases in terms of the overall structure of a training DVD-video, called *Voilà Madame*, and its role vis-à-vis other teaching tools, like those of IT. Finally, in Section 4, we present a discussion of the pedagogic implications of our approach.

2. Analysis of the instructional needs

In this particular context, the analysis of the instructional needs can be summarized in three basic questions: (1) Who are the immediate stakeholders[3]? (2) What are their expressed needs and wants? and (3) What are the desired outcomes? The answers to these questions provide a basis for establishing the parameters of the instructional context and the ensuing "pedagogic scenario".

2.1 Who were the immediate stakeholders? The principal direct stakeholder was a regional human resources director in charge of supervising and distributing new instructional materials to all the managers of one of France's major chain stores in the region of *Nord/Pas de Calais*. Other significant stakeholders were: the managers of each of

[1] Definition: "Training" in this context implies a "planned process to modify attitude, knowledge, or skill behaviour through learning experience to achieve effective performance in an activity or range of activities. Its purpose, in the work situation, is to develop the abilities of the individual and to satisfy the current and future needs of the organisation" (Manpower Services Commission, UK, 1981) Lesson 11, *B.A (Hons.) Business Studies*. Bolton Institute, UK cf. http://www.bolton.ac.uk/campus/business/babus/humanresource/restricted/hrm_lesson11/hrm_lesson11.html(Retrieved9.12.2001. The Welsh concept of *hyfforddi* (to train) offers the complementary notion of "making the way flexible" for the learner, as opposed to *addysgu* (to educate, to instruct) based on the Latin notion of *scala*, (ladder, "a climbing device").

[2] Definition: By linguistic *pragmatics* is meant the study of meaning and language use that is dependent on the interrelationships of the speaker, the addressee, and other features of the context of utterance that influence both the means of expression and the interpretation made of an utterance cf. http://www.ling.gu.se/~biljana/stl-97/pragmalect1.html (retrieved 7.12.2001).

[3] Definition: A *stakeholder* represents groups of people or individuals that can have an influence, in this case, on the training needs. Researchers R. Oudman, A.M. Vos, and J. Biesboer review various methods of "Stakeholder Analysis" at http://panoramix.univ-paris1.fr/CRINFO/dmrg/MEE98/misop001/ (retrieved 27.10.2001).

the different chain stores of this northern region of France on the border of Belgium; the company's trainers and; the sales assistants as the end-users of the instructional material.

2.2 What were the stakeholders' expressed needs and wants? The issue to be addressed was the upgrading of sales assistants' professional skills by regular and varied in-house training sessions. This meant that new instructional material had to be versatile, so that it could be used both in a traditional, face-to-face instruction, as well as for personal self-study. Furthermore, the technology to be used had to be that which already existed in the work place i.e. VHS videotapes, paper-based documents and email. Interactive multimedia resources, like the DVD-ROM, were excluded because it meant buying new equipment (e.g. multimedia computers) that would exceed the training budget.

2.3 What were the desired outcomes? The essential objective was to show sales assistants how to adapt their verbal and non-verbal behavior to the needs of customers. This was to be done by helping the employees to better understand company policy in dealing with customers. In this context, the instructional material had to help learners become more efficient in their sales techniques by focusing on practical problems that customers encounter at the stores.

3. Scenistic Approach

The principle of the *Scenistic Approach* (Leleu-Merviel 1996) is to provide a framework of scripting a series of "events" in a way that it ensures overall coherence and transparency in the design process. The technique has five major steps: (1) the diagesis, (2) the scenario, (3) the scenation, (4) the scenic, and (5) the setting up of the situation.

3.1 Diagesis: This involves everything that belongs to the imagined/proposed setting of the document as expressed through the (lesson) content. This includes taking stock of, for example, the different educational paradigms and approaches (cf. LABOUR *et al.* 2001) that could be used to achieve the objectives identified in the analysis of the instructional context.

In this case, it was decided to use a self-monitoring approach to problem-based learning, centered on skills-reinforcing tasks. This meant that learners would be systematically encouraged to first identify possible dysfunctions in the scenes presented to them, followed by choosing the appropriate solution to remedy the situation. In this way, learners, some of whom have up to 25 years experience in their job, would be called upon to use their existing knowledge to critically reflect on familiar professional situations. It was hoped that by using such a constructivist inspired approach (cf. Jonassen *et al.* 1999) new knowledge would graft itself onto existing knowledge structures.

One of the practical consequences of reflecting on the diagesis, led to one of the pedagogue-designers of the production team to go on a three-day training course with one of the company's sales teams. This permitted the team to have a more direct understanding of learners' pedagogic needs.

3.2 Scenario: The scenario represents a deliberately thought-out text that has a storyline (closely associated to a series of meaningful events), details of the author's intention, a projected target audience, and a message. In so doing, it constructs the narrative and represents the « story » as it unfolds. In this way, the scenario provides a guide to subsequent choices concerning the production of the document.

The 23-page scenario of the project, called "*Voilà Madame*[4]", was based on notes taken during the three-day training course, and from interviews with sales assistants, heads of departments and management of the company. This led to some major modifications in what the client wanted, notably not to limit the training to VHS videotapes but to also use the DVD-video[5], which was not too expensive and offered, for example, more "interactivity[6]" than videotapes. For the sake of economy, we cannot present the original scenario in any detail, except to say that it has 18 specially written scenes with a playing time of 22 minutes. (A more complete picture of the details of such a pluri-media scenario can be found in a recent paper presented by Labour & Benoit 2001).

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[4] According to Scene 10 of the scenario, the term *voilà Madame* ("Here you are Madam") said as a farewell phrase to a client is to be avoided. When concluding a conversation with a client, one must say *Au revoir, Madame* (Goodbye, Madam) and not, as in this scene, *voila Madame*, a term used to indicate the handing over of a requested object to someone.

[5] The DVD-video, made available in the USA in 1997, can store over two hours of video on one layer of the disc. Compared to a VHS videotape, the DVD-video can make seamless skips from one scene to the next in the sequence chosen by the viewer without waiting while the tape goes backwards or forwards. Commentaries, subtitles, alternate endings and additional language tracks can also be added onto a DVD, which offers a high quality picture and sound quality and can scan, pause and chapter access, and as a laser reads the DVD there is no wear and tear, or loss of fidelity over time.

[6] Definition: By *interactivity* is meant the possibility of action-reaction choices that the system gives to users (cf. LABOUR 2001, p33, 37-44).

In broad terms, after learners have viewed an appropriate narrative fiction recorded on the DVD-video, a series of face-to-face skills-based training tasks can be done on a particular point, for example, in weekly workshops. In this context the observation sheet for Scene 1 (Figure 2), translated from French, shows the pedagogic approach provided for by the scenario. After observing the scene on the DVD-video as many times as necessary, the learner is asked to identify recommended behavior ("Positive points") from dysfunctional behaviors ("Negative Points", "Problems related to manners or behavior"). Finally, some "points of reflection and development" are suggested for further discussion on-line (e.g. by e-mail) or off-line, or for self-study.

The DVD-video is thus only one aspect of a pluri-media learning package (Figure 1).

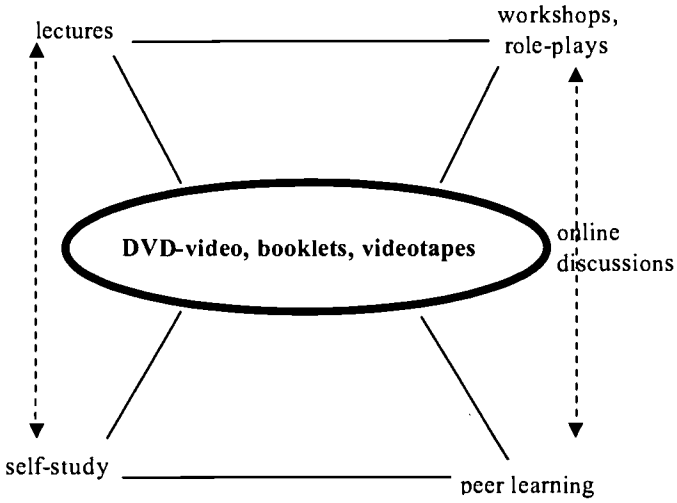

Figure 1: A skills based training scheme

Scene 1: Prologue and answering the telephone
Length: 1 minute 30
Start mark: 1mn20. Stop mark 2mn53
Staff concerned: all

☺ **Positive points**

PQ1	The person picks up the telephone after the 4th ring (or after the 3rd ring).
PG3	The person is not chewing gum.
PQ6	The waiting time is less than 30 seconds.

☹ **Negative points**

PQ2	The person does not mention the company's name.
PG2	The person does not mention the name of the store where s/he works.
PQ2,7	The person does not say "Good morning".
PQ2,7	The person does not present him/herself with his/her first name.
PQ7	The person does not indicate in which department s/he works.
PQ3	The person replies in a muffled voice without articulating.
PQ4	The person does not reply to the client's question.
PQ4	The person does not connect the person to the correct department.
PQ8	The person replies in a disagreeable way, making it clear to the client that s/he is tedious.
PQ5,9	The person does not say "Goodbye Madam" at the end of conversation.
PQ5,9	The person does not add a friendly word, nor a polite one at the end of the conversation.

Problems related to manners or behavior

- The person interrupts the client while s/he is speaking.
- The person asks the client to call back later.
- The person hangs up on the client.

☞ **To go further, points of reflection and development**

- The person justifies him/herself by mentioning the problems in the store: "I am alone". How could the person have avoided this situation?
- The person gives a negative image: "I don't know". What should the person have said?
- One should never ask a client to call back. What should one do?

Figure 2: An observation sheet for *Voilà Madame*

3.3 Scenation: The scenation is the text that organizes the events or states, taken from the scenario, as *operationally* interacting elements. It can be equated as the routes that learners could take. The scenation is comparable to the text of a play "on paper" but it is not the theatrical performance itself.

To make maximum use of the video document the objective was to provide a set of meaningful units that would facilitate an intuitive navigation of the document for learners and trainers. But, the essentially linear format of the video documents provides a limited amount of interactivity, so users of the DVD-video could only access the scenes via a *Menu of themes*, or an *Index of scenes* (figure 3). The *Menu of themes* contains a series of sub-themes/contexts of everyday situations (e.g. in the parking lot) and is aimed more at learners. Whereas, the *Index of scenes* is directed more at instructors who wish to present a teaching sequence around certain objects (e.g. household appliances).

3.4 Scenic: The scenic transposes the scenation into concrete, hands on reality. It is at this stage that one makes aesthetic and logistic choices within the limits of the practical and financial constraints, conditions of usage, etc. (see Section 2 above). This includes the choice of the medium for a given fragment taken from the structure of the scenation (*e.g.* text, sound, or both together) in order to facilitate the acquisition of knowledge.

In this case, the colors of the company were chosen as the guiding color scheme to present the interactive pages of the DVD-video. Blue, pink, yellow, green and orange hues were added to identify the five different themes in order to facilitate user-navigation and to make the document more attractive.

The choice was confirmed to use the DVD-video in order to maximize the use of the pedagogic material, even if ideally a DVD-ROM, with greater potential for interactivity, would have been preferable.

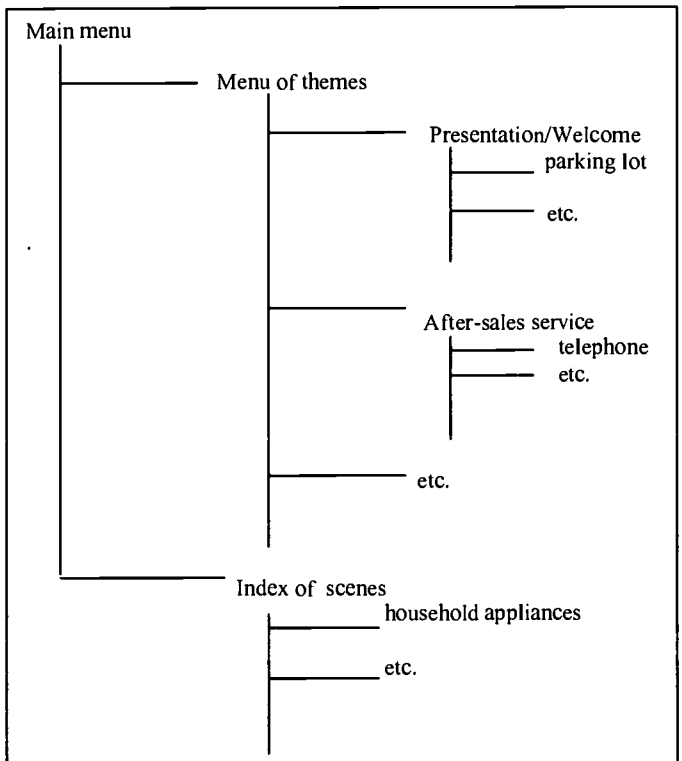

Figure 3: Navigation schema of *Voilà Madame*

3.5 Setting up the situation: This final phase defines the practical ways that the user can in fact access the (video) fragments of the document via user-functions. On a computer, this could be a button, an icon, a joystick, and/or a mouse-click.

In the case of a DVD-video one of the main user-functions is the *remote control box*. Unlike, for example, the "mouse" of a DVD-ROM, the remote control box does not provide an on-screen pointer to facilitate non-sequential navigation in the document. The challenge of the DVD-video and its remote control box is then the danger of potentially laborious linear and sequential navigation.

Taking into account the factor of limited navigation possibilities, 15 icons were created to help learners go through the document efficiently. In this way, the relatively few interactive possibilities of the DVD-video format could be put to profitable use.

In order to get maximum use of the specially written scenes, a 25-page booklet was also made for learners, and a separate one for trainers to help them use the material pedagogically. This was linked to more general guidelines concerning the different skill-based learning tasks possible that could be done online and offline with the DVD-video (Figure 1).

4. Discussion

Without taking the details of his observations too literally, Treicher (1967) reminds us in his book, *Are you Missing the Boat in Training Aids? Audio-Visual Communications*, that most people "learn" (retain) 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they both see and hear, 70% of what they discuss with people whose opinions they value, 80% of what they personally experience, and 90% of what they teach other people. In short, a training program should go beyond providing teaching aids that learners can both "see and

hear". The pedagogic scenario of instructional materials needs also to focus on the human interactional elements of learning to include meaningful "discussions", transforming inputs into "personal (pedagogic) experiences", and "teaching" other people (e.g. peer learning). In this light, the video/film format offers some specific advantages, as highlights the film historian Turner.

> ... (with) the abandonment of the idea that there was a core of meaning in a film which the audience had to discover. Meanings are seen as the products of an audience's reading rather than as an essential properly of the film text itself. Audiences make films mean: they don't merely recognize the meanings already secreted in them (Turner 1988:121).

A training scenario should then, for example, get learners to discuss how they saw a scene and how this relates to their personal experience and its future implications for them. It is in such domains that network-based technology like the Internet (with its discussion forums, chats, emails, etc.) can facilitate learning by communicating with different people. That said IT, like Internet, is not in itself pedagogic. What makes these tools so, is the appropriateness of what is put in them (content) and how this is done, hence the need for operational frameworks such as the *Scenistic Approach* and other related ones (e.g. Laubin 2002) aimed at making optimal use of the content.

5. Conclusion

In this paper we hope to have taken a step towards reconciling the design process with the need for accountability and transparency in presenting the *Scenistic Approach* as a working framework for designing teaching resources. The flexibility of this approach makes it transposable to other teaching contexts in schools and universities seeking to prepare learners for real-life situations.

The originality of this work and its relevance to IT-based training lays in its attempt to optimize the use of a single visual and audio recording in adopting a pluri-media approach to instruction. A lack of space has not permitted us to present fully the scenario, save to say that such a scenario can be complex and needs careful and systematic planning and team work, hence the need for a transparent operational framework like the *Scenistic Approach*.

Finally, it is our contention that the *Scenistic Approach* can allow an economy of scale, and of time and effort in optimizing available resources for maximum efficiency. This is a crucial factor, as it is our working hypothesis that the more teachers see how their IT-based creations can be optimized, the more they are likely to use IT in their everyday practice.

Abstract

One of the challenges of lifelong education is creating instructional materials to encourage adults to renew what they feel they already know. This is especially true, in the field of professional training, with experienced practitioners and where information technology often plays an important role. Using a *Scenistic Approach* to plan a series of teacher-led and self-access "lessons", specially written video sequences were reused in various ways so as to optimize the time and effort of material makers. This included making access to the content matter more attractive and more varied so that learners can acquire knowledge in their own way. To do this a series of hybrid pedagogic techniques was used, which included traditional lectures, role-plays, a self-study video, a DVD-video and learning *via* an electronic network.

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INFUSING TECHNOLOGY INTO THE CLASSROOM: A CASE STUDY IN INTERDISCIPLINARY COLLABORATION

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Abstract:

Effectively incorporating technology into the classroom is paramount at many K-12 and university institutions. Both administrators and faculty have seen pronounced increased in effective learning through the use of multimedia technology when presenting any subject. However, not all teachers can be expected to learn the complex applications that enable effective instruction to their students. New forms of interdisciplinary collaboration need to be invented and investigated. These new forms should incorporate technology more readily and effectively while having a low impact on the already over-burdened schedules of faculty and teachers. Following are the results from a case study of a unique form of support developed through Radford University library's MultiMedia Center and Music Department.

Introduction:

The course, entitled Introduction to Film Music (MUSC 373, Computer Music Composition), incorporates an historic survey of film music media including literature, recordings and film as well as composition assignments. In the assignments, students are required to learn the parameters of different eras' film music and technology (including the limitations) and then create their own soundtracks to "audio blanked" film clips. The assignments were edited on a computer and presented in VHS or CD format to the class. The course's curriculum is based traditional collegiate education themes combined with technology via a collaborative, co-instruction effort between a university music professor and multimedia technologist.

Technologies and composition practices of each medium and time period are presented chronologically and are studied, discussed and experienced through assignments. From Radio to modern film, each era (compositionally and technologically) is delivered.

Results:

The collaboration of the two professionals is mutually educational. Issues arising regarding the intense areas of traditional music and contemporary technology were discussed and resolved by information from both sets of expertise. The findings from this experimental case study offered profound results:

1. Instructors do not bear the burden of 'learning it all' before they incorporate technology into the classroom. In this case study, both professionals concentrated on their expertise and were able to offer students a higher level of scholarship because they were not required to focus on or fumble through unfamiliar subject matter.

2. Instructors are involved in faculty development as they simultaneously impart and absorb expertise in their relationship with the co-teacher. Traditional faculty development in technology requires faculty to attend application-training seminars, often with mixed results. A faculty member may be required to learn an application for up to 100 hours before developing the multimedia materials, which necessitates further time investment. Further, the success rate and information retention is variable at best.

The collaboration offered each instructor an opportunity to learn key features of the other's discipline. Teacher and student alike learned from the classroom presentation of materials offered by each instructor as well as through the preparation of each lecture. This form of faculty development offers a timely and efficient manner of technology training. Further, a higher success rate of information retention was achieved.

3. The student benefits from the interdisciplinary delivery and application of course materials, part of which include the dual perspectives and expertise of the faculty. Moreover, students enjoy a fresh approach and are better informed as a result. By having two professors from different disciplines, the students are able to pose questions to each instructor and draw interdisciplinary parallels between the two professions.

Conclusion:

This course represents an intuitive utilization of resources, and the student reaction makes it an exceptional experience for all persons involved. At its core, this case study evidences a situation of one faculty member actively seeking another for technological and educational insight. Logically, the scholarship of both instructors increases as a result of the collaborative sharing and dissemination of applied knowledge both inside and outside the classroom. The outcome is an interactive, cross-disciplinary study that yields highly successful faculty development while also creating a new and exciting environment for student learning.

As technology is further incorporated into the classroom, it is important that instructors and administrators look for non-traditional ways to create better learning environments through multimedia. Traditional paradigms regarding faculty development-style 'tech training' cannot account for all the learning that is needed in the ever-changing instructional technology field. The case study presented here is simply one way of accomplishing this end.

Film:

A 25-minute documentary film was produced from in-class footage of interviews and discussions, as well as instructor interviews, commentary and samples of student work. This film reveals in detail the efforts made by the instructors, outcomes of the assignments by the students and a candid discussion on issues of teaching collaboratively. The film offers further insight into the results of the experiment and is available from the authors. Contact plewis@radford.edu to order your copy.

University Faculty Needs and Desires: Support Model During Web-Basing and Web-Enhancing Courses

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Abstract: University faculty consistently weigh the expectations associated with teaching, research and service. Through the faculty desires to support the success of the learners, numerous faculty have waded into the murky waters of Web-basing and Web-enhancing their coursework. The experience, knowledge and interest associated with designing superior Web-based and Web-enhanced coursework must be shared with university faculty venturing into this new arena.

Introduction

University faculty have numerous expectations placed upon them through out their professional career. The teaching, research and service expectations can, at times, exceed the capacity of even the brightest and most focused of professionals. Adding the time and effort that is required to follow the instructional design process for Web-basing and Web-enhancing coursework, the faculty have nary enough time to complete their duties. Therein lies the crux of the situation; the best and brightest faculty are immersed in the teaching, research and service expectations of their careers, yet they are the ones with the experience, knowledge and interest in designing superior Web-based and Web-enhanced coursework for the learners.

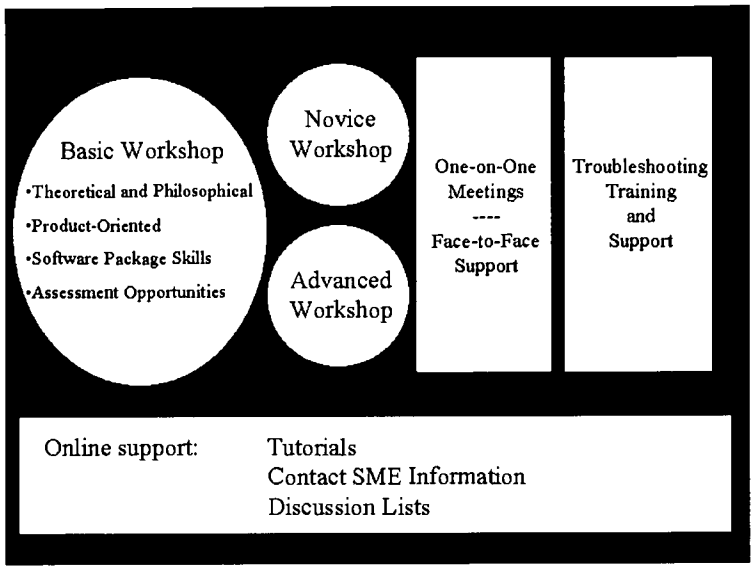
So as to take some of the pressure off of the faculty, it is imperative to design a support model for faculty endeavors that will encourage the brightest, best and busiest faculty to seriously consider Web-basing their coursework. Support models take numerous directions, with all-inclusive support models not necessarily being the most appropriate for the university under consideration. The progression of a smaller university through the Web-basing and Web-enhancing of upper-level undergraduate and graduate coursework has developed and revised support models that have worked well, worked with some successes, as well as barely supported faculty with the desire to Web-base and Web-enhance their specialization area coursework. Such support models that address university faculty needs and desires, pertaining to Web-basing and Web-enhancing coursework, are of utmost importance.

Professional Development Opportunity Model

The initial consideration when planning to develop professional development opportunities for university faculty must be the time allocation asked of the faculty. All-day events are not realistic goals; due not only to the time allocation but also to the amount of information dispersed during the professional development opportunity. Once this understanding has been realized, then the next step is to consider the process towards successfully meeting the objectives of the professional development opportunities. An initial, large-group environment is appropriate, but then the university faculty should be offered the opportunity to either re-take the initial subject matter experience in a small-group setting or choose to further their level of experience within that subject matter realm by self-selecting towards the more advanced level small group experience.

After this professional development opportunity has been realized, the opportunity for one-on-one, face-to-face support is a component of importance. Enabling university faculty to work within their familiar surroundings offers a level of comfort and support that is desired whenever a new learning experience occurs. As well, World Wide Web-based support components should be available to support the learning that was achieved within the large group and small group professional development experiences. A just-in-time model of knowledge dispersal is appropriate, as well as specific materials associated with the sessions.

Finally, listservs and bulletin board interactive activities should be available so as to either disperse information to interested members of the university faculty. This telecommunicative level of support offers numerous possibilities for important technical and theoretical support and discussions upon the training activities, as well as modeling and practice for university faculty so that they can integrate these telecommunicative activities into their Web-based and/or Web-enabled coursework after they have obtained a comfort level with the communication tools. Following is a graphic representation of the professional development opportunity model described above.



Topics of Importance to University Faculty

Defining the scope and sequence of the professional development opportunities is an initial element of importance towards the success of the stated objectives. The initial phase was focused upon three distinct professional development opportunity sessions that would emphasize the basic creation of a Web-enabled syllabus for the university faculty who participated. The three sessions are described as follows:

Session One:
Objective: Support faculty in developing a Web support site for one of the courses they are currently teaching during Spring 2001. We will offer faculty an instructional template, show them how to manipulate the HTML using Netscape Composer 4.7, hyperlinks (internal navigation links and external)
Reward to Faculty: 5 megs of server space for each faculty member who attends the session, using UHCL server resource allocation

Session Two:
Objective: Support faculty in making Adobe PDF documents, and using file transfer protocol (FTP) to publish Web site
Reward to Faculty: 5 megs more (total of 10 megs) of server space for each faculty member who attends the session, using UHCL server resource allocation
At the end of the Session Two session, faculty will receive a disposable camera to record graphic images to place on their Web site, a coupon to have the film rendered to a CD-ROM for free

Session Three:
Objective: Support faculty to manipulate, integrate and upload digital graphic images into their Web site as well as FTP to the Web server
Reward to Faculty: 5 megs more (total of 15 megs) of server space for each faculty member who attends the session, using UHCL server resource allocation

Each of the professional development opportunity sessions noted above offer the university faculty a distinct reward, so that the level of motivation is maintained through out the faculty participation. As well, each session offers distinct objectives that can be met within a three-hour block of time.

Conclusion

The objective of the Web-basing and Web-enhancing professional development opportunities described within this manuscript enable all UHCL faculty, SoE and other college faculty, to supplement or replace f2f lectures and activities with Web resources and activities. By the end of the three professional development opportunity sessions, the goal is for each faculty member will have an instructional Web site for at least one of his or her courses.

Web, Web-Enhanced or 80/20: Choosing the Instructional Model that Makes Sense

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Abstract: The focus upon distance education over the previous decade has offered numerous hardware and software shifts that can support distinctly stand-alone Web-based and Web-enhanced learning environments. Now the question asked is how to make the learning environments more effective.

Introduction

Distance education has been a reality since radio and telephone have been viable options for teaching at a distance. Yet many suggest that the World Wide Web, with a stable Internet structure stimulating its rapid growth, has introduced significant new possibilities for learning environments. Perhaps the delineation between Web-based and face-to-face courses have reached the point wherein appropriate models that integrate Web-based and face-to-face learning environments must be considered.

Web-based and Web-enhanced learning environments have become viable options for educational programs. Educators have moved beyond the mere integration of the Web as knowledge-level support systems, towards the introduction of higher order thinking skills integration and a focus upon learning communities within a Web environment. Perhaps the aspects deemed innovative are merely appropriate instructional strategies that are being labeled as ground-breaking due to the novel learning environment labeled the World Wide Web. As the Web ages and experience accumulates there is a growth in the number of models of distance education. Evidence and logic suggests that combining web with f2f may indeed have distinct advantages over complete web based learning or all f2f.

Pareto Principle

The 80/20 ratio first proposed by the Italian economist, Pareto, in the early twentieth century (Hafner, 2001) to explain an economic phenomena in a human economic system, such as in Italy in 1906, wherein 20 percent of the people owned 80 percent of the country's wealth. "Over time and through application in a variety of environments, this analytic has come to be called Pareto's Principle, the 80-20 Rule, and the "Vital Few and Trivial Many Rule." Called by whatever name, this mix of 80%-20% reminds us that the relationship between input and output is not balanced" (Hafner, 2001, paragraph 1). This is an appropriate framework towards considering the economic and educational phenomena that is under creation within the Web-based learning environments available for today's learners.

20% of Students Can Take 80% of Instructor's Attention

As the economic phenomena stated within the Pareto Principle is appropriate, this same consideration towards focusing efforts upon the "vital few" students refocusing 80 percent of the instructor's attention upon themselves is a concern within all learning environments, but especially within a Web-based or Web-enhanced learning environment wherein the instructor's time is spent communicating with the learners who vie for valuable instructor time and attention.

Concerns Based Assessment Model (CBAM)

To address this significant issue, implications towards the learner and faculty practices that support the 80/20 rule must be considered. One model that supports is the Concerns Based Assessment Model (CBAM) that offers the following stages of concern: (1) Awareness; (2) Informational; (3) Personal; (4) Management; (5) Consequence; (6) Collaboration; and, (7) Refocusing (National Academy of Sciences, 2002, paragraph 6). Through the CBAM stages of concern, consideration towards different appropriate and successful practices that would enable all learners to obtain the desired level of interactive activities is possible.

Distance Education

Within distance education, more specifically Web-based distance education, the interactive activities available to the subject matter may not always be sufficient for all learners. Therefore, the faculty member focuses an inordinate amount of time ensuring that the learners receive an appropriate and successful level of information and communication. The learner's personality and level of self regulation has a significant level of interplay within this environment which, in turn, may effect the learning environment and the level of assistance required of the instructor. For these reasons, the Pareto Principle must be considered when focusing upon the learning experiences within distance education.

Pareto Principle Applied to Distance Education Courses

Learners have distinct needs that must be met within a learning environment. Whether this learning environment takes the shape of a face-to-face course, a Web-based course, or a Web-enhanced course, the learner's needs are of utmost importance. The reality of the successful learning environment must be addressed. Further, the institutional, faculty and community needs are concentrated upon within the Pareto Principle realm; introducing the Web-based learning environment for up to 80 percent of the learner's needs and then meeting in an optional face-to-face learning environment at least 20 percent within the course timeframe would offer an 80/20 solution that would: meet student needs; increase institutional effectiveness; meet faculty needs; and, meet community needs.

Developing a situation wherein the learners, the institution, the faculty and the community needs are met is not only appropriate, but must be an expectation of the successful learning environment.

Conclusions

Each subject area that delves into the world of distance education must consider the instructional design of the course delivery mode so as to ensure the successful knowledge acquisition of the learners. Within some subject areas, a Web-based environment may be appropriate; however, there are subject areas that not only suggest but actually demand a level of face-to-face interaction so as to ensure the achievement of the learning objectives. Web-based, Web-enhanced and face-to-face of instruction are each appropriate models towards the delivery of instruction, yet the subject matter should drive the instructional design and delivery mode of the course. Each of these distinctly separate yet appropriate learning environment models have strengths as well as weaknesses, yet the subject matter, learning objectives, assessment modules, learners, instructional opportunities and real-world educational environments must remain the center of the decision-making process in order to design superior instruction and learning environments.

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Web, Web-Enhanced or 80/20:
Choosing the Instructional Model that Makes Sense

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Abstract: This paper suggests that the processes of change are moving web educators toward new ways to consider web education and that the change process is ready to refocus the current implicit assumption of web education: a web course is delivered exclusively by web interface. One way to refocus is to apply the Pareto Principle (PP) to web education. The PP suggests guidelines for combining web with f2f within a single course that is consistent with the evolution of change while lowering the barriers to teacher education on the web.

The focus upon distance education over the previous decade has offered numerous hardware and software shifts that can support distinctly stand-alone web-based instruction. Many teacher education programs have been among the first to embrace web education and benefits such as learner access and convenience to sustain considerable demand. Some teacher education programs have rushed to the web while others have lagged behind with doubts. This paper briefly reviews the processes of change that are moving web educators toward new ways to consider web education and that the change process is refocusing the current implicit assumption of web education: a web course is delivered exclusively by web interface. The Pareto Principle (PP) when applied to web instruction provides a rationale for integrating web and face-to-face (f2f) activities. The ratio refocuses the innovation toward integrating web and f2f activities. The PP suggests a way to distribute instructional delivery according to the efficiency of each media. The PP suggests guideline for combining web with f2f within a single course that is both consistent with the evolution of change and removes barriers to teacher education on the web.

> a small number of causes is responsible for a large percentage of the effect, in a ratio of about 20:80. Expressed in a management context, 20% of a person's effort generates 80% of the person's results. The corollary to this is that 20% of one's results absorb 80% of one's resources or efforts. For the effective use of resources, the manager's challenge is to distinguish the right 20% from the trivial many (Hafner, 2001).

The Pareto Principle Explains The Advantage of Integrating Web with f2f

This means that the web instructor spends 20% of his or her effort putting 80% of the course content and activities to the web; conversely the remaining 20% will take 80% of the effort. Once the course is offered, the PP indicates that the instructor will spend 80% of his/her effort on 20% of the student interactions. Conversely, the PP indicates that a web learner spends 20% of his or her effort learning 80% of the course content and 80% of his or her effort learning on the remaining 20% of the course. If this is the case, presenting an alternative delivery mode for the effortful 20% delivered by web may benefit both the faculty and students if the effortful outcomes are similar for both.

The PP, a standard, empirically supported effort to results ratio, could guide the ratio of web activities and content to f2f sessions. This is a guideline suggested by the amount of effort required to engage in a web course. The principle suggests using a different delivery medium for the roughly 20% of the results that requires 80% of the effort. The 20% of the effortful but low yield activities would be conducted f2f. The principle may not be useful in all cases. There will always be some courses far better suited to one medium than another. For example, courses with expensive laboratory equipment are suited to f2f delivery for economic and logistic reasons.

On the other hand for many web courses, the 80% that requires the least effort to deliver on the web would complement 20% of the more effortful activities delivered f2f. The remaining 20% that requires 80% of the instructor's and students' effort to conduct on the web would be delivered through f2f sessions. These could include interactions between the faculty and students that arise from questions requesting more information about assignments, the content, course logistics, etc., than is accessed through the web. F2f sessions may be one way to address needs of high demand students for whom immediate interaction assuages their concerns; the instructor benefits as well by answering two or three related questions simultaneously in a f2f session. Other activities such as social interaction to quickly establish personal relationships among class members may also be better suited to f2f sessions. Experience and research will continue to define which activities belong on the web but the fundamental principle is that allowing faculty to offer courses that combine activities from both web and f2f in a ratio from 20/80 to 80/20 should lead to more efficient use of both media and better outcomes for preservice teachers, inservice teachers in graduate programs, and faculty than a single-medium course. The positive outcomes for faculty and inservice teachers are among a few other reasons to consider the Pareto Principle for structuring courses integrating two media. The PP presents an opportunity to address the concerns of web educators who have been active participants in web education for some time.

Early-Adopter Web Educators Following Change Theory

The evolution of faculty adopting web instruction is rapidly approaching a stage when the early adopters are turning their concerns toward improving upon the ways to use the innovation. In the early stages of innovation adoption, faculty who supported, promoted, and participated in web instruction, were early adopters of an innovation (Rogers, 1995). Because they were early adopters who embraced the innovation, they quickly began participating in web instruction well before most their peers did.

Consequently they were part of the driving force that shaped distance education at the advent of the second millennium. They were among the first to create the demand for the commercial interests that shaped the distance education market.

This pioneering group was the first to move through the sequential stages described in the Concerns Based Assessment Model (CBAM; Hord, William, Huling-Austin, & Hall, 1987) that was developed for use with teachers to identify their training requirements. The CBAM classification scheme identifies an individual's stage of change by the individual's concerns about the change. Typically, the person adopting the change will first be concerned about personal and management issues related to the change before he or she considers outcome issues such as student learning. The CBAM proposes that an individual adopting an innovation progresses through stages of concerns that correspond to their level of use with the innovation (Hall, George, & Rutherford, 1977). While the stages may vary by individual, most individuals progress through the stages relatively in order from personal concerns to outcomes concerns. Early-adopter web educators would be concerned about how to manage an innovation before they would begin to ask questions about its affect on student learning. In the later stages of change most educators begin to collaborate about the uses of the innovation. Those concerned about ways to improve upon the use of the innovation have concerns expressed in the last stage of change. Those in the final stage of change explore how the innovation can be used even more effectively than originally intended. Most faculty in the United States are past the first stages of awareness and information seeking and many more have personal concerns about how the innovation will affect them.

If the literature about the web is any indication, by the late 1990s early web education adopters had moved to concerns about how to manage distance education. Reflecting the management concern, the literature includes several guidebooks with prescriptions for creating and managing web-based instruction (Ellis, Wagner, & Longmire, 1999; Hall, 1997; Khan, 1997; Palloff & Pratt, 2001). These books are very useful for producing web-based instruction. Just as the publishing surrounding web course innovation offered solutions to managing web instruction so, too, has the commercial sector offered management solutions. Commercial interests in the form of "corporate entities specializing in total solutions . . . offering complete course and distance learning program management tools to institutions" are shaping the most dramatic online change in the recent past (Palloff & Pratt, p. xiii). Both the commercial and the educational sectors have often presented web courses as the alternative to f2f courses. The artificial dichotomy inhibits the adoption and integration of web with f2f for course delivery that has the benefits of both. On the other hand, the PP applied to web instruction can facilitate adoption and integration.

Transcending the Web-f2f Dichotomy

The discussion in web education literature often is polarized around web versus face-to-face delivery and the advantage of one extolled over the advantage of the other. On the other hand media comparison studies have long been ill advised. Much of the literature and research about and with web-based courses juxtaposes web with f2fcourses (e. g., Gilmore & Fritsch, 2001) although media comparison studies are not recommended. Even while eschewing "simple comparisons of Web-based courses to those employing any other format," one extensive review focused on the salient predictors of web student success (Anderson, 2001, p. 47). To examine what leads to web student success is to implicitly assume that web courses can and will be restricted to web delivery. This perspective assumes that the web is an alternative to f2f not a complementary media although even researchers have investigated web courses that included f2f activities.

Because researchers do not define web instruction the same, their conclusions about web instruction may not be comparable. One study with teacher education students operationalized web instruction to include f2f encounters although the abstract and conclusions do not refer to the inclusion (Daugherty & Funke, 1998). The researchers concluded that the students' reactions to web course interactions deviated from the literature: they were more positive and enthusiastic about web communications. Could the f2f interactions have accounted for the greater satisfaction with the web course communications? In this study teacher education students indicated that the primary advantage to web instruction was convenience in working a course into busy schedules. This is a benefit which students still valued strongly although they had f2f interactions included in the course. When combined, web and f2f activities and content offer unique advantages of each through a complementary instructional delivery mode.

Another recent article contrasting web to f2f instruction described two different commercial training courses, one delivered by completely web and one by f2f (Johnson & Buchanan, 2001). They concluded that the f2f course had more faculty and student discussions and the web course had more reading and drill and practice. In the f2f, faculty discussions took about 20% of the activity time and about 70% of the activities in the web were reading and drill and practice. The differing use of activities by course in one or the other medium suggests that it may be easier to include these types of activities in the respective medium each dominates. Therefore incorporating f2f with web may be useful for providing different types of activities more efficiently. Furthermore, applying the PP to the distribution of web to f2f activities can also yield positive institutional, environmental, and community welfare outcomes.

Pareto Principle Applied To f2f Courses

In the larger environment of the university, web courses with complementary f2f sessions can have positive outcomes for the community at large. Both quality of life factors such as traffic congestion and air pollution would be relieved be replacing even a few sessions with virtual activities or content at an urban commuter institution. For example, for every 5000 students who replace three f2f sessions a semester with web activities and content, there would be 15,000 fewer auto trips a semester; that is 60,000 fewer trips over a year to and from the congested urban streets surrounding the university. There would be a commensurate reduction in auto emissions and road congestion two serious urban problems. Replacing or supplementing f2f activities, such as lectures at an urban commuter university, with web-based information or virtual activities should ease environmental impact of the university on the region. Two f2f courses that replaced at least half of the f2f sessions with web activities could be scheduled in the same classroom space over a semester by alternating sessions. Students in web-supplemented courses will have the benefit of increased access to course materials and content and increased convenience created when f2f sessions are replaced with web. Benefits of placing up to 80% of the activities and content of a course most suited to the web on the web should yield benefits of both web and f2f courses.

Conversely incorporating some web into f2f courses should yield the benefits of both although perhaps in different ratios. Faculty and administration may stimulate further adoption among faculty be promoting limited web integration. Late adopters and

those most resistant to change would have a less dramatic and a less effortful change required to offer f2f courses that incorporate some web activities and content than to begin with a total web course. A partial adoption model for combining web and f2f courses will enable faculty who might hesitate to launch a 100% web course should find a web enhanced course much less daunting. They would be able to use f2f sessions, a more familiar mode, for feedback and discussion with students. Encouraging instructors to offer courses combining web and f2f sessions allows for a wider range of adoption possibilities to facilitate faculty adoption. Faculty might choose a predominantly f2f course with the web as a repository and distribution center for course syllabus, assignments and other materials. Some would also use it as a conduit for submitting assignments. Those who want to begin integrating the web can replace one or two sessions with web activities or content can do so. The combination approach is suited to gradual, incremental change that later adopters of an innovation require.

Administrators may realize the advantages of being able to schedule more classes in the same space. By enlisting more faculty to offer web courses and to supplement f2f courses with web activities and content, administrators should be able to schedule two or more courses within the same classroom. For example a web course with three f2f sessions could be in the same space, at the same hour for three of fifteen sessions shared with a f2f course replacing at least three f2f sessions with web activities. Administrators in teacher education programs should be especially interested since those programs often seek to innovate and to model best practice.

Students stand to gain the most since they will have the advantages of both media and be able to engage in whichever of the two media are most appropriate for the instructional activity. They will have the convenience of web activities and content combined with the efficiency of real-time, f2f interactions for activities such as clarifying or explaining web content or written feedback.

Conclusions

This paper suggests several reasons to consider integrating web and f2f activities within a course that may be more compelling than the reasons to use one medium over the other. There are potential faculty, student, administrative, community, and quality of life outcomes addressed through integrating web with f2f activities. The PP provides a guideline for one approach to integrating the two. Faculty and students can benefit from planned f2f activities designed improve the efficiency of the most effortful activities conducted in web courses. Administrators who support faculty efforts to replace f2f sessions with web activities encourage change among late adopters and may find new classroom space when f2f faculty replace sessions with enough web activities to schedule two courses in the same fifteen-week semester space. The community and environment may also benefit from reduced traffic congestion and pollution in urban universities that offer f2f courses complemented by web activities to replace the commute to f2f sessions. Finally applying the PP will facilitate the final stage of change among those web educators who are eager to devise new ways to use the innovation. The opportunity awaits those who want to move beyond managing a web course to redefining how the web should be integrated into a course.

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The Inquiry Learning Forum: Online Professional Development with a Community Orientation

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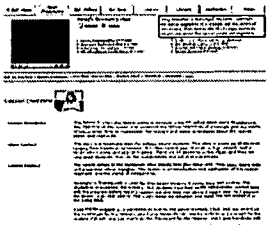
What is the Inquiry Learning Forum?

The Inquiry Learning Forum (ILF) is a NSF funded research and development project seeking to support an online community of K-12 math and science educators working together to share, improve, reflect, and create learner-centered classrooms. While developed primarily for Indiana math and science teachers, the ILF is open to all teachers, school administrators, university faculty, and pre-service education students interested in inquiry-based teaching and learning, free of charge.

The ILF is designed around a school metaphor. When members enter the ILF they have the option of visiting several "rooms" that are typical of a school building. Within these spaces members can obtain or share lesson plans, view video examples of fellow teachers, engage in online discussions, and work online with groups focused around a particular topic or idea.

The goal is not to present a practice to emulate, but rather to provide a vehicle for discussing teaching practice and advancing community and individual reflection and understanding. Through observation, discussion, and reflection, each participant can find his or her own path to continued professional growth and development.

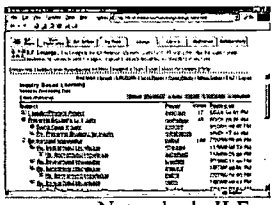
Classrooms



When we asked teachers what they would like to do for their own professional development, their response often was to see someone else teach. While that's difficult to do during the school day, the Internet makes it possible for teachers to "visit" other teachers' classrooms at a time when it is convenient for them.

In the ILF Classrooms videos of actual lessons act as anchor points for these virtual "visits." Each Classroom also includes teacher reflections on the lesson, discussions, links to various standards, lesson plans, examples of student work, and resources.

Lounge



Not only do ILF members get to virtually visit other teachers' classrooms, they also participate in discussions about practice with other professionals. The Lounge has a series of discussion forums focused on specific topics related to inquiry based teaching in it.

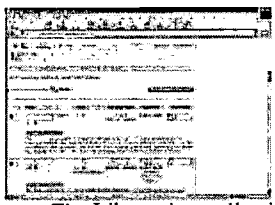
It is through these dialogues that teachers reflect on their own teaching and begin the process of exploring alternative teaching practices that they can apply in their own classrooms.

Inquiry Lab

The professional development activities found here can be utilized in a variety of settings, whether by individuals or groups. They are designed to fit the needs of teachers starting inquiry for the first time, or looking to enrich their teaching with more innovative applications of inquiry-based teaching.

The ILF Professional Development Labs are based on the Concerns-Based Adoption Model, commonly referred to as "CBAM" (Hall, 1979). This model of teacher change suggests that teachers go through various stages of change characterized by different concerns they have regarding the change or innovation. Our Professional Development Labs are organized around these stages and the types of concerns teachers have at each stage.

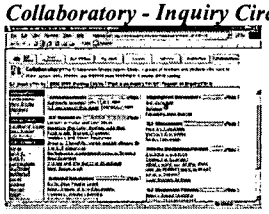
Library



The Library is a collection of lesson ideas and web links suggested by teachers for teachers. While viewing an item in the Library you can read how teachers have used the resource in their own classrooms. The Library has two collections:

- Lessons, Activities and Unit Ideas: materials and lessons developed by teachers for use in their own classrooms for you to download
- Web links and Other Resources: Links to materials, lessons and resources published in print or on the World Wide Web

Collaboratory - Inquiry Circles

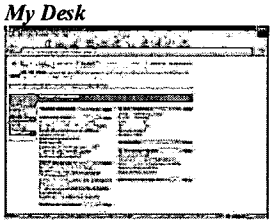


An Inquiry Circle is a collaborative group space in the ILF Collaboratory. It's a place where groups or teams can share resources, ideas, and experiences! These collaborations can center around:

- Curricular Topics (i.e. water quality, astronomy, etc...)
- Professional Development Opportunities
- College or university courses

Each Inquiry Circle has a facilitator who serves as the central contact person, provides new members with access to the Circle, and answers any questions. For example, a university pre-service instructor may want to create an Inquiry Circle for her students to work with teachers in the field.

My Desk



The My Desk space is a personal portal to the ILF. Through My Desk, users can:

- View and update their personal profile
- Leave notes in their personal journal
- Keep track of their ILF activities, classrooms and discussions
- Store bookmarks to both ILF and external resources
-

The ILF Office

The ILF Office is the administrative portion of the site. At the office members can find out more about upcoming ILF events, make a suggestion for improving the ILF, learn how they can be videotaped for future ILF classrooms, and meet other ILF members by viewing their online profiles.

Beyond Times Roman

Gillian Mothersill, Ryerson Polytechnic University, CA

Since the advent of electronic publishing in 1985, typography has ceased to be the exclusive domain of the craft-based typographer or graphic designer. In a short span of time, more type designs have been introduced into the marketplace than in the entire period of printing history prior to 1985. The widespread use of computer systems has placed layout and design decisions into the hands of many who are interested, but largely unqualified to make them.

The overabundance of typefaces, combined with the lack of understanding of the craft of typography, has consistently led to some egregiously awful examples of typographic design in published material, resulting in viewers ignoring or not receiving the intended messages, in part because they cannot read them.

This workshop seeks to look beyond Times Roman, the typeface that is the de facto standard on many current computer systems. Through a series of presentations, hands-on exercises, and typographic "scavenger hunts", the workshop participant will develop a practical understanding of:

- Typefaces, families and fonts
  - Size, slant, weight and width
  - Typographic measurement systems
  - Monospaced and proportionally spaced fonts
  - Serif and sans serif typefaces
- Readability and legibility
- Type sizes
  - How to select the appropriate size for your audience
  - How to select the appropriate size for your document
- Measure
  - Identifying the optimal column width
- Letter spacing
- Word spacing
- Leading or line spacing
- Alignment and justification
- Type colour, and "colour"
  - When to add colour, and when to avoid it
  - Colour and the effect of contrast with the substrate
- Special Effects
  - Stretching, bending, masking, adding blends and photographic imagery

Throughout the sessions, participants will learn to identify common errors in typeface selection and use, by investigating everyday items such as magazines, packages, and newspapers for problems.

In addition, participants with learn simple tips regarding mixing and matching typefaces in documents that they are designing.

The workshop will pay particular attention to the needs of the participants and their use and questions about typeface use, whether it is on the World Wide Web, or on materials printed on a laser printer.

Participants will gain insight into the basic technical considerations of selecting Truetype and Postscript typefaces for their documents.

Workshop participants will be provided with:

- A workbook for their session
- A list of typeface vendors and foundries
- An annotated list of resources for obtaining additional information about typography

Realization of a Decision-Making Support System within a Whole Class.

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Abstract: In this study, we will lighten the instructor's burden of a decision – making and develop a decision – making support system to support making an effective decision. The mechanism of decision in this system totals the data of a real class situation collected with LAN and the predicted data of a class situation that is determined by the instructor in the stage of instructional plan according to their point of view in the system. It also makes a guideline that becomes the interim data. This system applies the interim data to the rule of decision making and shows the advice that is needed for the instructor. This system has three mode. In an explanation mode, the system searches for a point that confuses students and advises them. In a questioning mode, the system analyses achievement situation of a whole class and shows advice.

1. Introduction

This paper describes the development of a decision-making support system within a whole class. This support system can help the instructor make an effective decision quickly and reduce the burden on the instructor, because it presents digestible information to the instructor in response to the information coming from the students in the class. This decision-making support system is based on Matsuda's (see[2]) instructional activity model.

2. Design of the system

2. 1. Connection of the instructional activity model and the test support system

Activities that are used for the test support system are underlined.

. Before the class, the instructor makes an instructional plan.

. When using a question as the communication method, input questions from the screen to make test questions for the test support system.

. In class, the instructor explains and gives directions using the Web, a black board, or by oral expression according to the instructional plan.

. S In addition, presenting the test using the Web.

. Students study the lesson contents and answer the test question.

. Students send test answers on the Web ,ask questions, and are free to express their feelings.

. The test support system gathers and summarizes the test scores in real time, and displays the result to the instructor.

. The instructor views the students' test results and estimates the degree of their understanding by way of their movements, facial expressions, and questions.

. Show the response of ., compare the test results to the predicted results.

. Using the results of . and ., carry out feedback.

. If there is no significant difference, continue with the instructional plan. If there is a significant difference, modify the lesson contents or the communication method accordingly to the teaching materials and the instructional aim.

2.2 Improvements to develop a decision-making support system

Explaining the detailed improvements with figure numbers of Figure 1. A decision of human is based on the gap between the predicted class situation and the real class situation. In order to support this system, the system needs to have information about the instructional plan including the prediction of the class situation. Then, in stage .,which is the making of test questions, set up an input interface consisting of the class's progress and input data of the class's progress consisting of four elements{the predicted data of the class situation, the data of the instructional aims, the data of the lesson content, and the data of the communication methods.} The predicted data of the class situation tries to find the cause of the test's mistakes and uses it to provide the instructor with advice by gathering the responses from the learners in the presentation. The presented teaching materials from . plus .' are constructed and can gather subjective evaluations of the class from the learner. This system needs to compare the predicted data of the class situation at . and the data of the class situation at . simultaneously by way of .'. In addition, the system of . plus .' acknowledges the gap and advises an appropriate response to it.

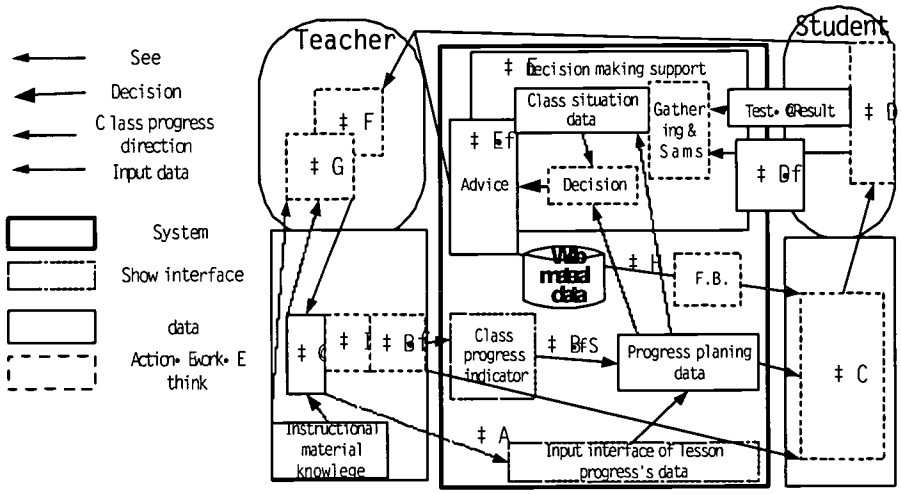

Figure 1 : Instructional activity of a decision-making support system

3. Conclusion

The purpose of this research is to build a decision-making support system that can help the instructor make an effective decision quickly and reduce the burden on the instructor. As a result, of this system being employ ed and evaluated in the experiment class, we know that a teacher accepts the advices from the system as an index of the judgment for the class progress support and confirm that this research purpose was attained.

4. References

[1] Hiroshi NAKAYAMA, "Development and effectiveness of test support system for an improvement of lesson", Japanese Soc iety for information and Systems in Education, Vol.16 No.1 P25-33.1999.

[2] Toshiki MATUDA, Kentaro TAGO and Takashi SAKAMOTO, "An Instructional activity model for developing a computer simulation system", Nippon Educational Technology Committee, Vol.15 No.4 P183-195 (1992)

Instructional Development for Knowledge Creation in Large-scale Class

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Large lecture rooms in universities have been designed to accommodate a large number of students to disseminate the most recent academic and/or professional knowledge produced in the higher education. The recent development of information technologies facilitates the knowledge dissemination through TV, Web sites and other technological media. The role of higher education is expected to change form knowledge dissemination to knowledge creation. Seminars and small group discussions are most widely adopted to meet this requirement. In spite of such expectation, large-scale lessons are indispensable in higher education due to financial reasons and social needs. The large-scale lessons in new style other than lectures are needed to develop for universal higher education in large diversities of audiences.

To develop such instruction in large-scale class, following principles and models are developed;

- Five principles for learning
  - ACCRR model (Autonomy, Collaboration, Contribution, Responsibility and Respect)
- Six components for learning plans and material development
  - MACETO model for instructional design(Meaning, Activities, Contents, Environment, Tools and Outcome).

This method was applied for the development of lesson plan in teacher training course at Bukkyo University in Kyoto. It is very difficult for students to start from the description of instructional objectives to develop lesson plans. They start to express their images and models and describe them in form of graphic representation to express their primitive concepts of school education;
Students have their experiences as learners in elementary and secondary school already, feel hard to start from reflection on teaching and have their images on school life, teachings and teachers. Starting from this assumption, students work in team and create instructional modules for their lesson.

Building scenario-driven, real-world online courses

CJ O'Connor, Arizona State University, US
Paul Skiera, Arizona State University, US

In this session, the ASU e-Learning team will share their experiences in developing an online Information Technology Fundamentals curriculum. The team will demonstrate how they use "real-world scenarios" to develop the course content. The use of a "Reusable Learning Objects" strategy will be demonstrated. The team will demonstrate how they created "virtual labs" to simulate the use of "real-world" objects, such as computer parts.

Interactive, Multimedia Online Courses: Meeting Administrative, Development, and Dissemination Challenges

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Abstract: This paper describes the challenges encountered during a 4-year grant to develop and disseminate online courses in technology. These challenges are administrative, developmental, and dissemination and includes: staffing, planning, evaluation, partnerships, intellectual property, interactive multimedia, learner involvement, accessibility, portability, and publicity, among others.

Project Description

The United States currently needs 350,000 computer networking professionals and an additional 1.3 million by the year 2005. Many adults, including displaced military personnel, recent GED recipients, and those with disabilities or special needs, want to begin or advance careers in networking. However, most of these adults do not have adequate access to training due to high cost and limited availability. In order to meet this need, Arizona State University (ASU), Cisco Systems, and Pearson are developing online networking and information technology curricula materials that include graphics, video, hands-on virtual labs, and simulations. The Fund for the Improvement of Postsecondary Education (FIPSE) grant has funded a nationwide integrated training program, the e-Learning Network, to provide 100,000 adult learners low cost, anytime, anywhere quality networking instruction and preparing adult learners for two existing industry certification examinations: the Cisco Certified Networking Associate (CCNA) and the Cisco Certified Networking Professional (CCNP). As of October 2001, the online CCNA and CCNP curricula have been completed and disseminated through the Cisco Networking Academies in high schools, community colleges, and other vendors. Cisco Press has published textbooks and lab companions for both of these curricula. Additionally, ASU has completed several lessons in the online Information Technology Fundamentals (ITF) curriculum, which are available through the ASU e-Learning Network web site. The ITF curriculum is intended to prepare learners for the CCNA courses as well as provide computer literacy for a wider population. Formative and summative evaluation of the networking courses is being conducted by outside evaluators in conjunction with 10 pilot sites around the country.

Challenges

Over the course of a 4-year, multi-curricula, multi-partner, and multi-million dollar project, one can expect that there will be challenges. Indeed, there has been more than enough to keep life interesting. That the project has continued on a successful path is a tribute to government support, project leadership, conflict resolution, positive thinking, staff shuffling, crisis management, talent recruitment, sheer will and determination, and an abundance of dedicated teamwork. This paper will briefly address administrative, developmental, and dissemination challenges likely to occur in a project of this nature.

Administrative Challenges

Administrative challenges include partnership issues, staffing, turnover, timelines, and costs.

Partnership issues

Probably the most critical administrative issue in a project like ours is the choice and formation of a partnership at the beginning of the project planning stage. Many government-funded grant programs require at least one partner who will contribute matching funds of at least 100% of the grant award. Initiating partnerships is a relatively easy process; maintaining them over a period of four years, however, can be extremely challenging. It is particularly difficult for partners who have never worked together before. Invariably, while partners may share common global visions and goals, when it gets down to the operational level, they may find themselves very quickly at a fork in the road, forced to go separate ways. Additional troubles can emerge in the form of battles over the rights to

intellectual property. The result is a recipe for a shaky partnership that needs significant and constant attention to keep it together. Better to have resolved these issues prior to beginning the partnership. Further complications arise when one partner "volunteers" the involvement of another partner, who then bails out of the project. Is the first partner responsible for the actions of the second partner? An economic downturn can force a partner to withdraw from financial commitments that were made in better times. For grant awarded projects, a loss of a partner can mean the collapse of the project, especially if matching funds depend on a single partner. In our project, a battle over intellectual property rights threatened to bring the project to a halt. We lost our publications partner (Pearson) after the first year, leaving the project temporarily without essential pilot sites, student scholarships, and funds for site coordinators. Nonetheless, critical partner support has continued, compromises have been struck, and the objectives of the project continue to be met. For long-term projects, partner recruitment never ends and time must be allocated to this important endeavor.

Staffing

Our project required experienced staff with skills in curriculum development, instructional design, technical writing and editing, web technology, multimedia development and tools, programming, graphics design, video production, networking and information technology subject matter, quality control, project management, presentations, research and evaluation techniques, and grants management. To turn a phrase, it took a village to deliver the goods. Hundreds of employees and contract staff worked for Cisco Systems on the development, production, and language translation of the CCNA and CCNP curricula. At ASU, 45 people (part-time and fulltime, employees and students) contributed their skills to the development of the ITF curriculum.

Turnover

Attracting and weeding talent is an ongoing, critical challenge. At the end of the first year of the project, the entire technical staff and project manager left ASU to join our primary partner at the time, Cisco Systems. A new project manager was hired to reconstitute a development team. Over the course of the second year, the team was rebuilt, but the loss of networking subject matter experts was never overcome. As a result, a great deal of time that was intended for production had to be diverted to researching content. In addition, the allocation of all staffing resources in the first year to product development meant that many project management tasks never got done until the second year. In the process of shuffling staff and reassigning tasks, we found some of our best talent within the student body at ASU, especially foreign students. Our best supervisors were professionals with practical graphics, video, and courseware production experience.

Timelines

A significant challenge involves keeping the project on target and producing the deliverables at the appointed hour. A significant amount of time was spent planning the curriculum, with input from pilot sites (students, administrators, and instructors) and subject matter experts. Course maps and course objectives were developed and reviewed. Web interfaces were drafted and tested, and usability studies conducted. Accessibility issues were researched and solutions tested. Production supervisors juggled priorities to handle this project along with several other large curriculum production projects. The word "deadline" seemed to appear in the daily dialogue as often as the word "hello." Yet, the project moved along, with Cisco taking over the CCNA and CCNP curricula and ASU focusing on the ITF. Project participants maintained focus, motivation, humor, and teamwork throughout all the challenges. The team was committed to quality, excellence, and innovation.

Costs

Developmental projects come with high price tags, which is why grant-supported projects are important, especially in the field of education. Our FIPSE grant award is for $2 million over a four-year period, matched with matching funds from our partner, Cisco Systems. To meet the challenge of cost containment, we employed a strategy to streamline the developmental process. This strategy involved the creation of "reusable objects" which include media objects (pictures, animations, video) and lessons or portions of lessons that can be used in several parts of a curriculum. Design templates and programming code also provide economies of scale.

Development Challenges

Since this project is a "development" project, you might expect there to be a number of developmental challenges. In developing a learning product, as with any marketable product, it is essential to assess the target audience and tailor the development to meet their needs. Feedback from students using early versions of the CCNA online courses indicated the need for improvements to the web interface and structure of the program, calling for: non-scrolling, limited text per page; more interactive exercises and less reading; printable pages; more consistency in terminology throughout the course; and better navigation to indexes, glossaries, and lessons. We took these into account in developing the ITF web interface and modules and added innovative features to make the learning experience more interactive and robust.

Content

For the Cisco Networking courses, content was developed to reflect the knowledge and skills required for Cisco technicians. With a great deal of experience in the field, it was relatively easy for Cisco developers to define the course objectives and content. They also had a previous version of the CCNA course to build on. When it came to the Information Technology Fundamentals (ITF) curriculum, it was a different story. The ITF was intended to be both preparatory to the CCNA curriculum and to widespread computer literacy programs. The ITF would hopefully be used to encourage adults new to technology to prepare for a career in technology. To meet these goals, several groups were contacted for input and several debates were held to determine the scope and sequence of the content for the ITF curriculum. The development team selected ten modules, developed course maps, and wrote course objectives. Some modules (the Number Systems and the Electricity modules) were difficult to write, especially since subject matter experts were scarce. Other topics (like networking and computer components) were much easier. One particularly challenging task was to solicit input from networking and A+ Certification instructors at the pilot sites. While we did receive input on the types of modules and subject areas that the instructors thought were essential, we pulled most of our material from other sources for subject matter.

Quality vs. Quantity

One of the biggest challenges in developing online courses is balancing the "quantity" of course content with the "quality" of the learning experience. The CCNA and the CCNP emphasize quantity of content, with dozens of chapters of material in each course, mirroring much of what can be found in the Cisco textbooks, but supplemented with animations and lab activities for students to carry out in the classroom. The ITF modules were constructed to incorporate Pareto's Law; i.e., we addressed only the 20% of the content of A+ and Net+ curricula that would account for 80% of the common knowledge and everyday scenarios that a computer user or new technician would encounter. Then we took this concentrated core and "made it come alive" as a media-rich learning experience, using multimedia such as animations, video, simulations, photos, charts, interactive exercises, crossword puzzles, and more.

Web Interface

The web interface for the CCNA and CCNP curricula was designed by Cisco to be delivered in many countries and many languages. As such, it incorporates the "Cisco" look and a consistent navigation throughout. The act of standardizing an interface creates a new challenge: dealing with the inherent limitations in the degree of creativity and variety that can be produced within it. With the ITF curricula, a great deal more flexibility was planned into it, while also maintaining a consistent style and navigation. The use of *Macromedia Flash* provided us with a large degree of flexibility in terms of creativity, but has also produced challenges in terms of accessibility issues. In the coming months, we will be creating printable and accessible versions of our ITF modules and will have an opportunity to see how our interactive lessons and web interface translate to handle accessibility issues.

Another challenge we faced was how to "personalize" or "customize" the ITF learning experience, which we felt was important as a way to save people time and provide customer service. We set out to answer some customer service questions. Firstly, why should users have to wade through content they already know? Secondly, when a user quits a course and returns to it another day, why should they have to remember what they already reviewed and how well they did on their assessments. Thirdly, wouldn't it be nice if users could take notes while going through a lesson and store them online, to retrieve them another day? In order to provide the tools to address these questions, the technology of personalizing a web site involves databases, tracking scripts, and dynamic delivery methods. All this requires developmental time, logistics, programming, database maintenance, and login procedures. It also requires the commitment of the user to log in and out correctly. The personalized module enhancements we developed are provided only to Pilot Sites. The general public gets the "plain vanilla" version of the ITF curriculum, which is an excellent program, just not personalized.

Interactivity

During the planning process, we took the position that it was critical to incorporate as many real-world scenarios, activities, and simulations that would provide a rich learning experience and ample opportunities to practice skills in a virtual environment. To this end, we hired students with programming skills to develop a number of simulations and tools including the following: partitioning and formatting a hard drive; editing the BIOS settings; setting up a workstation on a network; a Dynamic Notepad for taking notes while working through the modules; and a messaging feature to send feedback to the developers or to send questions and comments to an instructor. One of the challenges we faced involved the duplication of reality. For our simulations, every screen and activity must look as close as possible to what a learner might encounter in real life. To achieve this goal, real life activities had to be videotaped or repeated several times to record all the text, actions, and visuals. involved in the process. These were translated into graphics and programming scripts, which were then orchestrated into lessons containing information as well as instructions on how to carry out the steps. As can be imagined, it took months, a great deal of patience, and attention to detail to produce the simulations and integrated lessons. To be cost-effective, we had to be selective in what we would simulate. One important criterion we used was to choose specific processes that learners would most likely need to do as a technician but which would be difficult for them to practice at home or in classrooms.

In addition to simulations, we created other devices to involve the learner, including: knowledge checks, crossword puzzles, animations, drag-and-drop activities, math calculations, "show-me" opportunities, pre-and post-assessments, tours, glossaries, and references. Each of these devices presented challenges in their creation and implementation. The ultimate challenge we face now has to wait for months (until we get sufficient users and feedback) to determine if any of our design strategies is making a difference to learners or instructors. This determination will be the task of our evaluators.

Evaluation

An independent valuation of products is essential in a development project. We need to get feedback from instructors and students to determine if the courses are making a difference in their lives. In order to acquire meaningful information, our external evaluator, Rockman Et. Al. has had to gather baseline data such as demographics, student achievement levels, and student satisfaction from the pilot sites. This was no small task. Another round of data gathering will need to be conducted from the same sources after the ITF modules have been distributed and tested. Hopefully, the challenges will be met and we will be able to gauge the effectiveness of our learning products.

Dissemination Challenges

The third area of project challenges is one that we are just beginning to encounter and have another 18 months to fully experience. As we move to complete the developmental stage and begin to move into the dissemination stage, our challenges include: product delivery, marketing and publicity, and web maintenance.

Product Delivery

With the involvement of Cisco Systems, the dissemination of the CCNA and CCNP curricula (online and in print) has been done through their widely dispersed Cisco Networking Academies, which are administered by Cisco and delivered primarily through high schools and community colleges. The population they serve exceeds 100,000, so there is a large audience for the courses. Through their assessment system, Cisco is able to obtain valuable information on student achievement and needed course improvements. The Cisco Networking Academies also allow networking instructors to contribute lesson materials, which expands and enhances the curricula. The ITF modules are being released (published on our web site) at an average rate of one per month, with two versions available (a public version and an enhanced version for research purposes and available only to participating Pilot Sites). Our strategy involves the release of the public version first, followed by the research version. There are 4-5 lessons in each module, with an average completion time of 2 to 3 hours to complete each module. As the modules are released, emails are sent to the Pilot Sites informing them of new additions. A distribution list of additional potential users is in development and will be used extensively in 2002.

Marketing and Publicity

Getting the word out and encouraging use of the courses is a challenge common to most developers. Cisco's course distribution system, the Cisco Networking Academies, provides an excellent marketing and publicity venue. It is our hope that, in addition to the CCNA and CCNP curricula, Cisco will also promote the ITF modules to the

Academies. We expect to make the rounds again in person to the Pilot Sites to encourage their participation in the use of the ITF modules. In addition, the forward plan is to develop a certification course to be offered at ASU once all the ITF modules are completed. We have begun to show the learning products at conferences and offer project papers on our web site.

Web Maintenance

Cisco maintains an assessment server for the CCNA and CCNP courses and the participating schools in the Cisco Networking Academies maintain content servers. ASU maintains the web server for the ITF modules. There are many challenges for both avenues: bandwidth issues, maintaining user databases and confidential test scores, updating content and maintaining links, tracking usage and analyzing web logs, and keeping servers running through various outages and maintenance routines. Staffing these activities and sustaining them past the grant award period is a critical challenge. During the early stages, when usage is low and demand is reasonable, project managers can be lulled into thinking all is well. Then, there comes a day when things go wrong or demand explodes, and customer service is compromised. We use the web logs to stay alert and prepare for the future.

Summary

The e-Learning Network, as a FIPSE LAAP grant project, is progressing with online courses to prepare adults for networking careers. In its path, many challenges have loomed and been met; many more remain. Administrative, developmental, and dissemination challenges have been the subject of this paper. More information is available on our web site and listed below.

Web Links

The e-Learning Network http://elearning.asu.edu
- LAAP Poster Presentation (Nov. 2001)
- Original Grant Proposal
- Grant Abstract
- Year Two Annual Report
- Article published in Centerpoint Journal

Information Technology Fundamentals Curriculum http://elearning.asu.edu/itf/

CCNA & CCNP Curriculum http://www.cisco.com/warp/public/779/edu/academy/overview/curriculum/

Technology Based Learning & Research (TBLR) http://tblr.ed.asu.edu

DOE / FIPSE Program http://www.ed.gov/offices/OPE/FIPSE/

Cisco Networking Academy http://cisco.netacad.net

Cisco E-Learning http://www.cisco.com/warp/public/10/wwtraining/elearning/

Cisco Press http://www.ciscopress.com/

Cisco Systems http://www.cisco.com

Teacher as Instructional Designer Approach to Integrating Technology Into Preservice Teacher Training

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Abstract: This poster/demo will provide information on a PTTT sponsored project in process at the University of NC at Asheville. This project is part of a PTTT collaboration between UNC-Asheville, Appalachian State University, Western Carolina University, and Warren-Wilson College. The emphasis of this project is to improve the opportunities for preservice teachers to integrate technology into their student teaching field experiences. Preservice teachers, cooperating teachers, and university supervising teachers were brought together last summer in order to design and develop a thematic unit based on the North Carolina state standard course of study and the integration of information and technology skills. The thematic unit during the summer 2001 institute was archeology. Several teams of teachers participated in this project during the summer to develop unit plans that were then implemented during student teaching in the Fall 2001 semester. Teams used instructional systems design methodology in helping them to decide when and why to use technology as resources to match the selected instructional strategies. Teacher creativity in designing interesting and motivational learning environments is the key to this approach. Further projects of getting teams to work together before the student teaching semester are being developed at UNC-Asheville based on the success of this summer project.

Introduction

The University of North Carolina at Asheville (UNCA) is involved in the continuous process of improving the preparation of today's teachers. The integration of technology and information skills into the regular classroom is a goal of the UNCA teacher education program and the Impact program in North Carolina.

> "Media and technology programs should focus on student achievement and involve the entire staff in planning instructional programs that are enriched by high-quality resources and state-of-the-art technology. A learner-centered approach to instruction focuses attention on media and technology programs as vital instructional forces that expand, support, and complement classroom learning." Impact, Teaching and Learning. North Carolina Department of Public Instruction. http://www.ncwiseowl.org/Impact/Teaching_learning.htm

The information explosion and the technological advances have caused educators to re-examine what and how we teach and how we prepare others to teach. The effort to change the vision of education to include a dynamic, integrated, student-centered approach will take collaboration between everyone involved in the educational system. "Collaboration, like communication, is essential in today's world. Working with other organizations to promote a common goal has a greater chance of success. Collaboration involves the communication of one's vision in such a way as to generate support for one's program." (North Carolina Educational Technology Plan 2001-2005, http://tps.dpi.state.nc.us/techplan2000)

The NC Impact program goes on to further explain that "Collaborating to achieve instructional goals means:

- Ensuring that instruction takes place in a student-centered, project-based environment.
- Planning projects and activities with teachers that are relevant to real-life problems and supporting the development of critical thinking and problem-solving skills in students.
- Creating small group activities with heterogeneous groupings to accomplish curriculum goals and objectives." Impact, Teaching and Learning. North Carolina Department of Public Instruction. http://www.ncwiseowl.org/Impact/Teaching_learning.htm

Project

UNC-Asheville, in collaboration with Appalachian State University, Western Carolina University, and Warren Wilson College, received a PTTT grant in 2000-01 for three years. The overall purpose of our grant is to help us improve opportunities for our student teachers to use and integrate technology into their student teaching field experiences.

This presentation will highlight the Teacher As Instructional Designer approach that UNC-Asheville is presently using to help preservice and inservice teachers integrate technology into their classrooms. The main thrust of this approach is to tap in on the creativity of teachers as designers of the instructional environment. Creative teachers can design interesting and motivational learning activities to engage students in real-world, challenging instructional experiences. This approach was used last summer during a collaborative week-long workshop between the four colleges.

The theme of this summer project was archeology. We had 12 teams of cooperating teachers, student teachers, and supervising teachers who participated in this project. The beginning of the project included an overview of archeology and information about an archeological dig taking place at Warren Wilson campus. We then provided an overview of the Teacher As Instructional Designer approach. This approach, which uses the five major steps in the instructional systems design (ISD) method, was used to show teachers how they can select the instructional methods and materials most appropriate for their stated objectives. All teams worked on specific unit plans that could be used the next semester by the student teachers. Teams went down to the local archeological site and dug for archeological evidence. Then they spent the rest of the week on the Internet and created their unit plans and web sites to support their plans.

At UNCA, we are also incorporating the Teacher As Instructional Designer approach into our education classes and into workshops for cooperating teachers. Emphasis is placed on the use of student-centered instructional strategies, particularly strategies involving inquiry-based learning and real-world, problem-based learning. Teachers are asked to develop thematic units that integrate information skills and technology skills as suggested by the Impact program in North Carolina.

One of the methods for integrating technology with a thematic unit is WebQuest. WebQuest web sites provide students with information from which to begin their investigation into the topic of study. "Information is the basic ingredient in the active, authentic learning required of today's student." (AASL and AECT 1998, 83). Two examples of integrating technology with thematic units are included in this poster/demo session. The first example is the creation of a WebQuest web site focused on the theme of archeology. The second example is a web site and discussion forum focused on using primary sources to study the impact of specific wars on the development of the United States.

We hope that this presentation will give others ideas on how to use the ISD process to promote the creativity of teachers in designing exciting and innovative learning environments for higher-level thinking skills and human growth and development.

"Wiring the schools and populating them with computers is necessary but insufficient to ensure equal opportunity to share in the digital revolution. Children need . . . motivation to learn. They need a redesigned education system and teachers who have been retrained and reoriented. Innovative technologies cannot make up for educational professionals who lack innovative methods and merely replicate learning models that don't work." (Tapscott 1998, 262)

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Using web-based situated learning as a design strategy in teaching elementary economic concepts

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Abstract

Background of This Study

While we are now living in the knowledge-based economy era, economic education becomes essentials for all citizens. However, there are obviously lacks of the present teaching materials and instruction in our schools, especia lly for elementary teachers and students in Taiwan. Based on the above needs ,the author would like to develop a web course, entitled *ECONLAND*, for teaching basic economic concepts for elementary students.

The web is a powerful medium with many unique attributes for learning. The web technology afford opportunities for multimedia presentation, communictaion, collaboration and knoweledge construction. In addition, there are several theoretical foundations to guide instructional design for this web-basedlearning environment, such as constructivist principles, scenario-based, authentic activities, multiple roles and perspectives, collaborative construction of knowledge. These principles described as situated learning strategy are illustrated in elsewhere in details (Cognition and Technology Group at Vanderbilt, 1993; Oliver & Herrington, 2000). The value of situated learning has also been demonstrated in classroom settings through many empriical studies (CTGV, 1993; Shyu, 1999, 2000).

Purposes

Therefore, the purpose of this study were to analyze and synthesize the economic concepts suitable for 3-4th grade elementary students; design and develop web-based teaching material; design and develop the teachers' guide for the web course; and to conduct a for mative evaluation .. The basic economic concepts were taught, such as scarcity, decision-making, opportunity cost, production, money and interdependence. By integrating the instructional strategy of scenario-based situated learning into design, five pieces of story were presented. Students have to solve the challenges presented from the end of each story and thereby acquire the knowledge of those economic concepts. Finally, based on the results of the formative evaluation, suggestions of

revisions and the directions for further investigation were also included in the end of paper.

Significance of this Study

This study was significant because it provides an example of how and what to teach economic concepts on the web for kids, and it also demonstrates an instructional model using situated learning strategy for developing and implementing web-enhanced learning activities for teaching economic concepts.
The web site is located at http://econland.et.tku.edu.tw.

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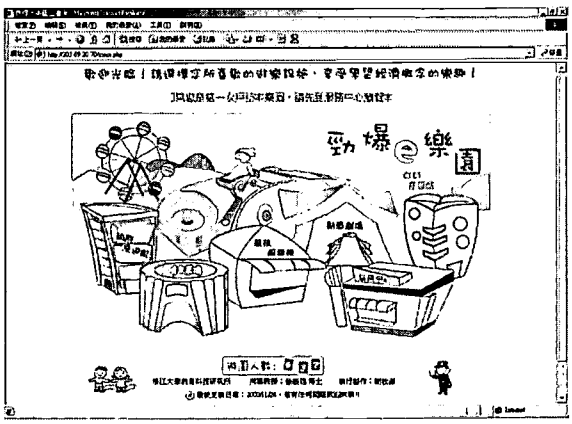
a Sample from the Screen:



Key words: Economic education, Elementary social studies, Web-Based Instruction, Instructional Design, Situated learning

Adult Learning Styles and Distributed Learning: A List of Preferences

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This research study examines adult learning styles and preferences in enrollment in distributed learning courses. Initially, a questionnaire (Yes/No and narrative format) was developed which provided definitions about learning styles, such as visual, auditory, kinesthetic, or varied combinations of these styles. The learning styles and definitions were based on the research of Howard Gardner, Judith Warren Little, and University of New South Wales, Faculty of the Built Environment. Quantitative and Qualitative results were obtained and implications for further research were also cited. Fifty post-graduate students in business and/or education participated in this study. All respondents were voluntary and information was received anonymously. Participants also completed a demographic survey identifying age, gender, and ethnic background.
The underlying questions of this investigation included:

1) Is there a certain type of adult learner who is more (or least likely) likely to enroll in distributed learning courses?
2) What information regarding online learning course formats (animation, video, audio (text/ voice/music)?

For example: are adults who identified themselves as a combination of visual and kinesthetic more likely to register for online courses than adult learners who identified their learning style as solely auditory or visual?

As more undergraduate and graduate university programs offer courses online, it would appear to be both cost effective and pedagogically appropriate to examine the learning styles of their students and align course design accordingly. The intended audience for this presentation includes university faculty, students (undergraduate and graduate), and administration interested in developing enhancing distributed learning course work across academic disciplines.

Part of the Online Teacher's Curriculum:

Designing for Collaboration and Participationin Distributed Netbased Learning

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Abstract: This paper addresses, in particular, the core challenges of stimulating participation and true motivation in learners to engage in interactive collaboration and knowledge building dialogue in netbased learning. The paper reports on an experiment, which suggests a twofold foundation for design: 1) the learning theoretical concept of Etienne Wenger (1998), and 2) an orientation towards student experiences and competencies, in order to design for collaborative knowledge building online.

Introduction

Design of distributed collaborative learning processes online seems a complex challenge (Collis, 1997; Bates, 1999; Harasim, 1999). To design collaborative processes, which truly integrate and draw upon in dividual competencies and interests of the adult student appears an even more challenging activity (Sorensen, 2001). It calls for an alternative pedagogical thinking, also in the education of teachers, producing new and pedagogically innovative instructional designs. For years, in particular within the area of continuing education, it has been part of the underlying set of pedagogical intentions to design online courses utilizing the individual student perspectives and knowledge and engaging students in interactive collaboration and shared knowledge building. This ambition has not been realized.

The reason for this is ambiguous. On the one hand, it may be rooted in a lack of awareness of the specific asynchronous virtual conditions for the unfolding of human interaction (Sorensen, 1997b). On the other hand, the lack of encouraging results is related to a weak foundation in learning theoretical frameworks. While the problem of designing for quality in netbased knowledge building dialogues is of a general nature, the need for stimulating motivation, engagement, and interactive processes seems especially outspoken in the context of continuing education (Sorensen, 2000). In this context, there is a need for pedagogical designs that in innovative ways attempt to mat ch the communicative virtues of the online environment with alternative, theoretically based, pedagogical implementations of student experiences. There is a need for student experiences and competencies to become operationalized in the virtual environment in such ways that they inspire and form collaborative knowledge building (KB) processes in what has been called "online communities of practice" (Wenger, 1998).

This paper addresses such challenge of instructional design as part of an innovative teacher education curriculum. As a background, section 2 gives an account of some of the experienced problems related to establishing online interaction. Section 3 outlines some of the basic concepts in the learning theoretical framework of Etienne Wenger and introduces a model, based on his concepts, for designing for participation (Wenger, 1998; Sorensen, 2001). Section 4 describes the research design of the conducted experiment as well as its assumptions, hypothesis, implementation and results.. While section 5 contains the concluding comments, section 6 forms the forum of future perspectives.

Distributed C ollaborative Knowledge Building Online : State of the Art

Any pedagogical design, including designs of netbased distributed collaborative learning, implies a latent – and sometimes unconscious - theoretical perspective on what learning is and what it ought to be. Such perspectives always form the context for the choice of pedagogical elements characterizing the learning process (Sorensen, 1997a; Fjuk & Sorensen, 1997). Therefore, it seems essential not only to become conscious of these underlying perspectives, but also to base designs on clear and conscious theoretical understandings, in order to be able to choose corresponding pedagogical-didactic features that are likely to promote the learning perspective and goals in question.

One of the most prevailing problems encountered in netbased distributed collaborative learning concerns the widespread lack of clarity of pedagogical design and practice in terms of stimulating a qualified interaction and collaborative KB dialogue. This includes the familiar experience of virtual learning spaces marked by silence and lack of "social presence", and it includes the lack of motivation and commitment between learners to collaborate. In particular, the problems of identification and distribution of teacher-learner roles in virtual learning processes seem to form the key factors in this complex of problems.

Quite a few learning designs of netbased distributed collaborative learning mirror a rationalistic and authoritarian perception of learning as something "delivered from above" by experts down to the "empty" students. In such cases it is not surprising that collaborative KB processes are absent. More thought provoking, however, seems the fact that in many cases where collaborative KB has actually been a main part of the design perspective, it very often does not materialize (Stahl, 1999 & 2000; Sorensen 2000). A clear understanding of why student collaboration so often is absent, regardless of these ambitions, remains to be identified. Unfortunately, the technology used often gets the blame for this – perhaps often unjustified (Sorensen, 2000).

The gained experiences with implementation of distributed, netbased processes evidently has had mixed success. From a perspective on learning as a collaborative phenomenon the significant problem of establishing a qualified collaborative leaning

dialogue working for KB seems to be, not only a very serious problem to address and resolve, but also the most complex challenge to deal with.

Collaborative Learning Through Online Communities of Practice

The problem of establishing a motivated, qualified interaction working for collaborative KB in a continuing educational context may be addressed through the theoretical framework, presented by Wenger (Wenger, 1998). The two aspects of interaction and motivation are among the central concepts treated in his learning theory, in which learning is viewed as processes taking place in what he calls "communities of practice" (Wenger, 1998).

Participation and Mutual Engagement in Negotiation of Meaning

To establish a collaborative KB dialogue (to ensure a KB process online) corresponds to his notion of creating "participation" in a community of practice. To ensure student initiative to participate in a collaborative KB dialogue points to Wenger's notion of creating "mutual engagement" (Wenger, 1998).

The theory emphasizes the role of experiences and practices of the individual students as means to support the development of group identity. About this complexity in relation to the learning process, Wenger states:

> Learning (...) takes place through our engagement in actions and interactions, but it embeds this engagement in culture and history. Through these local actions and interactions, learning reproduces and transforms the social structure in which it takes place (...). Learning is the vehicle for the evolution of practices and the inclusion of newcomers while also (and through the same process) the vehicle for the development and transformation of identities.
>
> (Wenger, 1998, pp. 13)

Wenger's theory incorporates "participation" and "mutual engagement" as central concepts in the learning process. About the concept "participation" Wenger states:

> Participation refers to a process of taking part and also to the relations with others that reflects this process. It suggests both action and connection. (...). Participation in this sense is both personal and social. (...). But when we engage in a conversation, we somehow recognize in each other something of ourselves which we address. What we recognize has to do with our mutual ability to negotiate meaning. (...) In this experience of mutuality, participation is a source of identity.
>
> (Wenger, 1998, pp. 55-56)

He characterizes "mutual engagement" as involving not only individual, but also collaborative competencies (Wenger, 1998 p. 76)

Social presence online, the fundamental element for creation of a collaborative KB process through what Wenger calls "negotiation of meaning" (Wenger, 1998), is threatened by lack of both "participation" (interaction) and "engagement" (Gunawardena, 1995; Rourke et al., 1999). Creation of an online presence in netbased distributed collaborative learning processes based on participation and mutual engagement in order to ensure the negotiation of meaning is a complex pedagogical challenge (Cornell, 1997; Sorensen, 1997a).

PANEL: A Design Model

On the basis of some of Wenger's concepts, PANEL (a model for instructional design of collaborative knowledge building processes on the net) was developed (Sorensen, 2002). PANEL denotes a learning process centered on collaborative KB and qualified by participants. The figure below is intended to illustrate the main ideas of PANEL (figure 1).

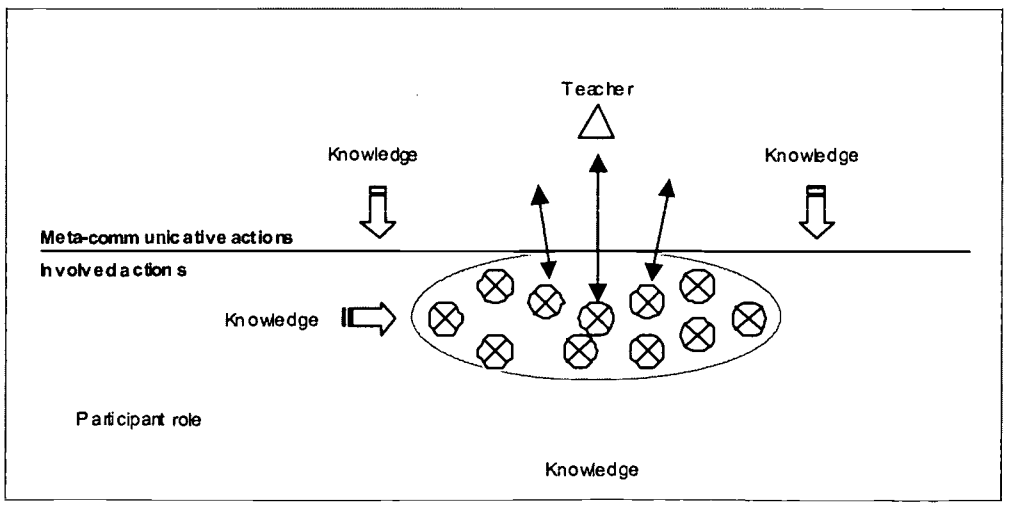

Figure 1: "PANEL": Pedagogical Approach for Net-Based Distributed Collaborative Learning

It shows a student-centered, open process in which knowledge resources enter dynamically from all sides via the participants as well as the teacher(s), in a process driven and motivated by participants. It illustrates the dynamic interchange between teacher and learner roles. It also provides a rough indication of how much of the teacher contribution evolves at a meta-communicative level. In sum, the PANEL model possess the following characteristics:

- It stimulates "participation" and "engagement"
- It is process oriented
- It denotes an open concept
- It is participant oriented
- It draws on student experiences
- It operationalizes student experiences
- It creates participant "ownership"
- It equals out teacher and learner roles
- It is, in principle, a lifelong model
- It invites to process assessment

Research Design and Implementation

At Aalborg University, Denmark, POPP (Problem-Oriented Project Pedagogy Approach) is the fundamental pedagogical approach used in design of distributed netbased education (Fjuk & Dirckinck-Holmfeld, 1997). POPP is a student-centred approach to learning and instruction which, in principle, rests on collaborative group work and truly integrates the perspectives of the individual students and allows them to take "ownership" in relation to all aspects of the learning process.

POPP is also the fundamental pedagogical approach in the design of our Danish cross-institutional, educational initiative, the MS in ICT and Learning(MIL). MIL provides continuing education for people engaged in educational planning and integration of ICT in learning processes at schools and all types of educational institutions as well as employees with educational responsibilities in different types of organizations. The administration of MIL takes place at Aalborg University, but the curriculum is developed and offered in joint collaboration between five Danish universities (Aalborg University, Aarhus University, Copenhagen Business School, the Danish Pedagogical University, and Roskilde University). A large part of the 40 MIL students are highly qualified teachers at the high school level with extensive university education and high competence within their individual work areas.

Assumptions and Hypothesis

In this paper I make the basic assumption that online participation and engagement in collaborative knowledge-building activities (as I have defined them) among students produces learning. Based on this assumption I make and test the following hypothesis:

An online learning environment that

(1) is built on the learning theoretical concepts of Etienne Wenger (Wenger, 1998) and
(2) provides mechanisms for students to fully use their experiences and competencies

will enhance learning.

Method and Model

With the goal of creating online presence, an experiment was conducted in the context of the first course module on MIL. To address the two problems of insufficient interaction and motivation, the course was designed according to the principles of PANEL (Sorensen, 2002).

The course module lasted 5 weeks. It was divided into a period of reading and preparation (two weeks) and a succeeding period of debate (3 weeks). According to the assignment given, the students, in the two-week preparation period, had to read the literature individually. The literature was distributed in three themes within the course content: Design of netbased learning processes. (The themes corresponded to the names of the three discussion fora in the succeeding period of discussion). The students were asked to distribute a set of roles among the members of their online group (on average consisting of 4 students). The roles were supposed to form and support their later discussion. Some were presenters, others were moderators, etc. The description of the roles was clarified in the assignment. Over the three weeks of debate both teacher and students agreed on attending the virtual learning space for a minimum of five times a week. In the debate period the groups each presented a commonly agreed problem, related to the literature, and initiate, conduct and wrap up an online discussion with all the peers. In parallel with the discussions, the students and the teacher engaged into meta-reflections and meta-communication in a specially created meta-forum, to reflect and discuss the experiences and processes of the students, as they evolved. The student were graded on the basis of a mixture of minimum requirements in terms of both quantity and quality that we viewed to be essential to enhance a collaborative KB process (Stahl, 1999; Sorensen & Takle, 2001a & 2001b).

Results

The 3 weeks debate period generated an enormous amount of engaged participation in collaborative KB (532 contributions, some of which were of the size of half a webpage). Assuming that online participation and engagement in collaborative KB activities among students produces learning, it is fair to say that my experiment has proved itself to be relevant. It was quite an exciting and, indeed, a very interesting activity to follow and participate in the KB process of the students. Viewed from a teacher perspective, the discussions turned out to be of very good quality (for a set of criteria, se Sorensen & Takle, 2001b). However, the activity did not exactly reduce the amount of work of the teacher. On the contrary, while it was very interesting to follow the discussions, it was quite a demanding job to read, relate to and comment on so many reflective and often very long comments. The discussions were truly student-centered and student-governed in that they produced an enormous amount of relevant collaboratively developed student initiatives, student perspectives and student experiences. The motivation of the students was very high and demonstrated an engagement in the discussions far beyond the minimum requirements in terms of both quantity and quality. The teacher occupied a role in the discussions equal to the students. Only in the meta-forum the teacher shifted between the role as a participant and the role as "the one who knows better".

Conclusions

This paper has been dealing with the overall question of how teachers and instructional designers - in particular within the area of continuing education – should approach the challenge of design of distributed, collaborative learning processes online. Assuming that participation and engagement in online collaborative knowledge building activities produces learning, and that online learning designs are enhanced through teachers and designers consciously basing their instructional designs on learning theory (through the use of PANEL), the results from this experiment are overall positive. It provides strong indication that by basing design on the learning theoretical concepts (participation and engagement) of Etienne Wenger (1998) and by operationalizing student experiences and competencies, collaborative knowledge building online (participation) increases measurably - through the stimulation of student ownership, relevance, and motivation (engagement). The two main intentions to create participation (interaction and online presence) and engagement (motivation through the operationalization of the participants' experiences) seemed to have been more than fulfilled.

Future perspectives

When aiming at enhancing quality in netbased distributed collaborative learning, it is necessary to for learners as well as teachers to navigate within a different pedagogical paradigm than a traditional face-to-face setting.

The changes in design, necessary to enhance quality, may be radical. Instead of navigating in a predictable pedagogical virtual universe where teacher roles, teacher guidance, and fixed resources are decided upon in advance, we are moving towards a virtual pedagogical paradigm marked by an instructional need to act, interact, and collaborate on a more equal basis. We are facing a new stage of learning on which fixed entities become dynamic and unpredictable, and in which new instructional competencies, like e.g. comfort in relation to communicatively improvising in chaos, are essential. The new paradigm needs a broader pedagogical perspective of the teacher. Even though the core competence is of pedagogical nature, it is necessary for both teacher and designer to obtain and utilize a wider and more holistic set of qualifications on which to base pedagogical considerations, actions and design decisions.

Acknowledgment

A special thanks to the Danish course participants, who started in the fall of year 2000 on the MS in ICT and Learning, for their positive and engaged attitude in terms of providing their "learning process" for the pedagogical-didactic experiment of this paper. I also thank my colleague, Professor Eugene S. Takle, for his insightful comments to the paper.

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Short paper: A Web approach to develop and deploy an effective course

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Townsend (1997) confirmed that Intranet and Extranet platforms offer an opportunity to store and provide learning materials and services in an easy and engaging manner. The author of this short paper experimented use the Web platform to organize course materials and to post Web pages. A powerful teaching and learning model could be built on these platforms for communicating, sharing knowledge, and producing interactive learning prototypes in a cost-effective manner for schools and colleges (St-Pierre, 2000).

The goal of this short paper is to describe the reasons why the Web should be used to develop and deliver courses on site and at a distance in an educational setting. The author will examine the characteristics that an effective web-based course should present.

The World Wide Web is a good platform for delivering instruction (Barnard, 1997; Starr and Milhein, 1996). Professors can create maps to guide the learners through their learning paths. The Web class can be well designed so that the learner can construct from the environment. Critical thinking could be introduced in a Web technology-based class when the students are asked to create Web contents or to search the Internet for different points of view on a controversial subject such as the Space program (Thoms & Junaid, 1997).

Faculty and students of the author's college have begun to realize the full potential o f the Internet as a teaching and learning tool. Students are beginning to perceive strong learning outcomes from on-line materials and Web-based contents. The instructional designer should use sound system design principles while developing web-based educational systems (St-Pierre, Bettin, Dillinger, and Ferraro, July-Sept. 1999). In his research, the author show that schools and colleges needed a theoretical and practical framework to develop in an adequate manner an open virtual course on the web (St-Pierre, June 2000).

On-line delivery is a means of fully augmenting or replacing other methods of teaching and learning. Mediated forms of delivery using the Web made it easy to update dynamic, constantly changing information. A well-designed Web-based instruction provides an efficient delivery medium for the instructor and an attractive content for the students in the classroom. Some instructors in various schools and colleges are using a Web package authoring tool to build a Web class format (Bent, 1997).

Web-based instruction could be defined as the application of a repertoire of cognitively oriented instructional strategies implemented with a constructivist and collaborative learning environment using the attributes and resources of the World Wide Web (Perkins, 1991). Research studies in education suggest that a constructivist-learning environment could be used to build virtual classes and provide an opportunity to explore a rich-hypertext content for the learner. This facilitates multiple linkages among content elements.

Several studies pointed to a paradigm shift that transforms the professor from simply a deliverer of knowledge to a mentor and a guide in the student learning process (Terrell, 1996). The students build Web pages incorporating numerous links to sites containing knowledge repositories. This enables the student to explore multiple avenues through contents of similar or divergent views, thereby reinforcing cognitive construction.

An effective web-based learning environment well designed with the help of educators should present the following characteristics: enhances student-to-student and faculty-to-student communication students share perspectives, students experience a sense of equality, instructors are more accessible; enables student-centered teaching approaches, accommodates varied learning styles, provides opportunities for exploration and discovery, provides 24/7 accessibility to course materials, continual access to materials, removes reliance on physical attendance, provides just-in-time methods to assess and evaluate student progress, and adds pedagogical benefits (St-Pierre, 1999).

Schools and colleges have to be innovative in introducing technological media in the teaching process. Training and professional development programs should exist to give the opportunity to experiment with web technologies before they use them in their teaching process. Teachers have to take ownership while developing effective web-based course with sound teaching media (St-Pierre, July 1999).

In conclusion, web-based courses are developed on a day-to-day basis without proper instructional design and experimentation with the learners. In some cases, the response time and the learning outcomes are neglected in the development process. Instructional designers, web-based technologists, and teachers have to work in synergy to prepare effective and sound open learning environments that will enhance learning outcomes. Assessment tools should be developed and used to measure learners'outcomes and satisfaction. The author of this paper will describe further pros and cons of developing and teaching with web-based courses at the conference.

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The Discipline-Appropriate Use of Computers in the Classroom: Two Case Studies

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Abstract: The authors present two case studies in the use of computers in the classroom, one involving an introductory computer science class, the other an upper division literature class. After describing each case, the differences are discussed, showing that pedagogical models developed for one discipline may not transfer to another, and that the discipline itself, beyond instructor's preferences or institutional policies, may determine what works and what doesn't.

Introduction

Our goal in this paper is twofold. First, we'll indicate that the successful use of information technology in the classroom depends more on the synergy between teacher, student and the learning context than on the technology itself. The use of technology -- as the primary vehicle for teaching (distance learning) or as an adjunct to the more traditional classroom -- is effective only insofar as it addresses this synergy. Second, we will maintain that one under-appreciated factor influencing teachers, students and learning contexts is the discipline itself, in a way that goes beyond simply paying appropriate attention to learning (or teaching) styles. We offer two case studies, one drawn from an introductory computer science course, the other from an upper division literature course, in support of these claims. Enthusiasm for online learning is of course high for students who live in areas not easily served by the traditional classroom, and courses accessible anytime and anyplace can provide valuable learning experiences for mature students who work full time and take courses when schedules permit. But the use of online learning tools *within* traditional campus-based course delivery structures has become popular as well (Wiring the Ivory Tower; Kathleen Morris; *Business Week*, August 9, 1999). James Duderstadt, President Emeritus and Professor of Science and Engineering at the University of Michigan, suggests that universities must themselves take a leadership role in remodeling the universities of the 21st century, and that new information and communication technology tools will play a key role in that mission, suggesting that universities will continue to have a physical existence, whatever their virtual roles may become (Duderstadt; *Chronicle of Higher Education*; February 4, 2000). This is not a completely uncontroversial claim; in a November 17, 1999 New York Times article, John Chambers, then Chief Executive Officer for Cisco Systems, asserts that "the next big killer application for the Internet is going to be education. Education over the Internet is going to be so big it is going to make e-mail usage look like a rounding error." (Thomas Friedman, Next: "It's Education"; November 17, 1999; *New York Times*)

As the situation as developed, however, and as other researchers have begun to look at what now seem to be inflated claims, online education has emerged as one aspect of a larger picture. Prosser and Trigwell, in "Understanding Learning and Teaching," argue that both teachers and students benefit from an increased awareness of their own personal experiences, approaches and perceptions of the learning process and that this awareness facilitates positive learning outcomes. (*Understanding Learning and Teaching*; Prosser, Michael And Trigwell, Keith; 1999) In particular, they emphasize that "good teaching involves an awareness of students' perceptions of teaching technologies (including information technology) used in teaching" and that these perceptions can significantly impact the learning experience either positively or negatively. (Prosser & Trigwell, page 169) Given their results, the successful use of information

technology in the classroom is clearly more dependent on interactions between teachers, students and learning contexts than on the technology; it may even indicate that there are some things technology cannot appropriately do, a point to which we shall return.

On the other hand, learning opportunities newly available through the use of technology can support desired learning outcomes—provided (our second claim) those outcomes, as defined not simply by the instructor or the institution but by the discipline *itself*, are congruent with what the technology can provide.

Astin's comprehensive study of student development characteristics in various higher institutional settings points out that active engagement of students in interdisciplinary courses, course with discussions, debates, and class presentations strongly correlates with critical thinking skills (*What Matters in College, Four Critical Years Revisited*, Astin, A. W., 1993). To the extent that technology can facilitate (or at least create the opportunity to provide) such active learning strategies, the effort will not only increase student involvement in the course, but also increase understanding of course concepts by relating them to independent inquiry and debate.

The question is whether available technology can do that too.

Case Studies and Examples

Our first case study involves an introductory computer science class. Pope's goal in implementing web-based tools the course was to increase opportunities for communication and participation. The class was small (approximately 25), but there was a considerable amount of material to cover and the topics that dominate the headlines -- Microsoft Antitrust litigation, Privacy in Cyberspace – provide fertile ground for discussion. He began using WebCT as a tool both for distributing informational materials and for on-line testing. In doing this, he relied on the students to read on their own time; his discussion/lecture now addresses related but different concepts in supplementing the text. Making the quizzes available online provided more opportunity for group and class discussion.

Students were positive; they could find their grades, course syllabus, assignments and topic notes in one central location.

In designing this kind of structure Pope was of course not alone. The University of Central Florida, for example, adopted a similar approach to improve its course in America National Government. There, the goals of the restructuring were practical as well as mission-oriented. The course enrolled over 2000 students in sections of 80-100 students. Classroom space was in critical short supply; increasing the number of sections was not a viable option. But the course also had a retention problem and surveys indicated that partially web-based sections had somewhat higher retention rates. Building on this, the department designed a web-based asynchronous learning environment based on web-based modules to encourage student participation. Class meeting time was reduced by two thirds. Bruce Wilson reports "students are, by necessity, more actively involved in the learning process. And instructional technology can also enhance students' critical thinking skills. ... The use of the Internet in teaching Political Science gives instructors more opportunities to design activities that involve students' direct participation and to follow clearly set instructional goals."("Best of Both Worlds? Web-Enhanced or Traditional Instruction in American National Government."; Bruce Wilson, Phillip Pollock, Kerstin Harmann, *Political Chronicle*, v. 12, no. 2, Fall 2000)

Pope himself also viewed the electronic interface as an opportunity to evaluate his own teaching. In any implementation of electronic technology in the classroom, a major evaluation of course objectives and teaching strategy is required, and he found this to be a welcome necessity. Drawbacks were a lengthy development and the availability of trained support staff.

Thurber, teaching an upper division class in English literature, had a different experience. It was not obvious to him that the standard distance education model was appropriate, given both the mission of the university and his actual task, which was to investigate, in this case, the work of the English poet William Blake. He does not give quizzes as such, although short exercises related to that moment's discussion do take place; there is no "lecture" and therefore no lecture notes. The course itself, in addition, was already as "interactive" as he (and his 24 students) could stand. Instead, the goal was to use the Web to investigate the nature of hypermedia, particularly as the poet in question, Blake, had done an 18th century

version of the same thing. His goals, therefore, were far more specific to the actual material—more contingent, more dependent on the actual poetry than on any idea about how to teach poetry.

He created, therefore, a course website (www.sandiego.edu/~thurber/CyberBlake) and asked the students to create their *own* hypermedia websites in lieu of the traditional paper—the rationale being, once again, not so much that hypermedia may be worth investigating on its own, which it is, but that, given this poet's practice, hypermedia are an appropriate, perhaps the most appropriate, response. The student's response was positive, in each case suggesting that the course be given again. Typical remarks included "It's about time English Departments did this," "an English course that is actually practical," and "I feel like I'm a writer too, doing something a little bit like Blake."

The course model that evolved, however, has almost nothing in common with Pope's. There was a course discussion board; very few students used it, feeling that opportunities for interaction were already sufficient; a few found it intimidating, while others viewed it as just another course assignment. (Participation in the discussion board was optional. Thurber wanted to see what would happen if it was not required.) There were electronic office hours; no one ever showed up, as students uniformly felt either that they already had sufficient access to the instructor, or that personal interaction was preferable. The emphasis was on the student's ownership and exploration of an electronic medium, the Web, rather than on using the Web to enhance communication or provide additional course materials.

Observations and Conclusions

It is about the differences between these two course structures that we would like now to reflect. Crucial to Pope's model was the use of the Web in the transferal of information from the instructor to the student. Indeed, he viewed, as is common, class sessions as adjuncts or supplements to information provided online.

But this is already not a model that transfers readily to an upper division literature class. Advocates of distance learning have traditionally emphasized that the use of electronic communications present opportunities for teacher-student interaction that effectively shift the educational focus from "teacher-centered" to "student-centered," away from the traditional lecture format and towards distance learning. But is the "transmission" of information, by itself, what college courses are for? If so, never mind the traditional lecture; colleges have been masquerading as libraries or, now that the technology is available, web sites. As far as the humanities are concerned the "transmission" of information is only one function college courses serve, and in some respects the least important.

While we acknowledge that modern educational philosophy mandates the critical importance of engaging the student in interactions that will impact his or her mastery of the subject matter, it does not then follow that the hallmark of student-centered learning is the use of computers in the classroom. Particularly if, as at our university, classes are small and instructors, on the whole, couldn't lecture if they wanted to. Is the give and take in small, discussion-centered, quasi-seminar situations comparable to what we can do in online discussion groups, even with real-time audio and video? If it isn't, what are the differences, and what is the educational impact of those differences? In the absence of hard answers to those questions, we wonder what's really at stake. What is being transmitted, pre-eminently in literature classes but in the humanities generally, is not the "information" we possess about, for example, Shakespeare, which is trivial, but the nature and kind of conversations we have and have had about his work. Knowledge in the humanities is both a process (not a result) and always contingent, socially constructed and crucially dependent on the context in which it is acquired. (The French Revolution in the eyes of post-1848 Europe was one thing; to Woodrow Wilson it was another; to ourselves it is yet something different.) From this perspective the transmission of information via the web is a non-sequitur. It isn't the Web that's the problem; it's the word "transmission."

Using computers according to the first model, therefore, at least interferes with and may even negate the goals and methods of the humanities—not because humanities instructors are Luddites (some are), but because the pedagogical model such approaches embody originated in one discipline, or set of disciplines, and don't readily transfer to another. Using computers according to Pope's model would deny Thurber and his students the chance to do what they want to do, which is both to learn what a writer actually did and to forge a response, together, to what she actually did. Here is where the under-appreciated difference between disciplines-- world views, at some point-- comes into play. There is no, and there had better not be, any such thing as socially constructed knowledge in the sciences. (Actually this is a matter of

current debate. What physicists thought about the significance of Maxwell's equations in 1890 was a different than what Einstein thought fifteen years later.) In the humanities, on the other hand, and particularly in literature, there is no knowledge *except* what has been socially constructed -- beginning with the fact that literature is made of language, the most social of all constructions, and including the fact that no writer, no matter how august, is a writer unless someone, somewhere, chooses to read her. The artist has an intent, to be sure, but that intent is only one of many variables connected to our mutual investigation of what a work actually is. Reader-response theory, as a matter of fact, would have us believe, in general, that readers are actually as responsible for what a work does as the author is -- maybe more so, in some constructions. Whether that is true or not, none of us reads or could read Shakespeare as Shakespeare did; but we still read Shakespeare! What's that, then? Shakespeare is Shakespeare but he's also us reading Shakespeare, in ways that he could not have foreseen but which are, still, what Shakespeare "is." For now. Meanings change; there are no "laws" in the sense that there are for the hard sciences.

Thus when Pope says, for example, that it's a good thing that online discussions can happen any time, that it frees people from the constraints of time and space so that they can say anything from anywhere, Thurber's response is -- why is that good? It would depend on the crucial insight that online discussion is the same as or better than the kinds of discussions his students and he have in real time, with their real bodies and their real minds in a real place, zoned into a writer they want to try to understand. Is virtual discussion discussion? (We know, for example, that people write and talk differently, and that they behave differently on- or off-camera. What are the differences, are they significant, and are virtual discussions better than, the same as, or worse than virtual discussions? And for what ends? There has been surprisingly little research in these areas, particularly as different disciplines are involved.)

Even, Thurber notices, Britain's Open University, one of the oldest and most successful implementations of computer-based instruction (http://www.open.ac.uk), supplements online material with local study centers (and tutors) at learning centers around the world. On this model, the discussion, always specific, always local, and always the joint product of the persons present on that occasion, is preserved, together with ancillary electronic material and the opportunity, which he welcomes for his classes, for students to write back at the sea of electronic media they are surrounded by, owning the web by helping, in a small way, to create it.

Our conclusion: we assume each of us is still *en route* to a full understanding of the implications of electronic technologies for higher education. We would emphasize, however, that our different disciplines seem to require different choices, different ways of using those technologies: one size does not fit all!

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User-Centered Web Site Design in the Instructional Technology Curriculum

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Introduction

This paper discusses the place of information design in the Instructional Technology (IT) curriculum at the graduate level. The discipline of information architecture has evolved to meet the challenge of organizing and using information to provide meaningful communication. Information architecture may be defined as the process of developing effective written or visual communication. While good information design stresses the importance of communication that clearly communicates an intended meaning, *user-centered* information design places primary emphasis on addressing the cognitive needs of the intended audience (Victor, 1999). This paper examines the IT curriculum and suggests course offerings to prepare instructional technologists to use the Web to its full potential.

The Instructional Technology Curriculum

A review of the IT literature reveals that little has been published specifically on the subject of the IT curriculum. There is of course a great deal of literature on such facets of IT as learning theories and instructional design and development issues, but it is striking how little of this literature deals with how best to teach these topics or how to combine them in an integrated curriculum. As would be expected, the literature that does exist calls for a mixture of theory and practice (Heinich, 1984; Winn, 1997).

Winn (1997) notes that most university IT programs emphasize practical skills over theory; it is "concerned with the applic*ation* of knowledge, not just its generation" (Winn, 1997, p. 35, italics in original). This emphasis has led instructional technologists to seek prescriptive models of instructional design. However, such factors as individual differences and the impossibility of accounting for all variables in an instructional setting teach us that a truly prescriptive model of instructional design is not possible. Rather than apply rigid rules to the design of instruction, the designer brings reason and experience to instructional decision-making (Winn, 1997, p. 37). Knowledge of theory is a resource the designer can draw on in designing instructional strategies for varying situations and needs. Instructional technologists should be grounded in theory related to perception, in cognitive theories of learning, and in theories of the influence of culture and environment on action (Winn, 1997, p. 38).

Toward a Web Design and Development Curriculum

Although the Internet has been in existence for over 20 years, the World Wide Web has only recently gained popular acceptance, and Web-based instruction is still in its infancy. What role does Web design and development play in the instructional technology curriculum? An informal assessment of the types of Web design and development courses offered by instructional technology programs (as evidenced by programs with course descriptions on the Web) reveals a limited number of such courses. Courses typically include basic HTML instruction and Web page construction, computer-mediated communication technologies, and distance learning development. Perhaps within the context of a comprehensive curriculum of educational psychology, learning theory, instructional design theory and practice, and software applications, such course offerings might suffice. However, as the Web is increasingly used as a communication and research tool, Internet technologies will become an indispensable part of the instructional technologist's repertoire. It seems reasonable to expect Web design and development courses to play a greater role in the curriculum.

An Internet Studies Curriculum

Maule (1998) proposes Internet content studies as an academic field of study. He presents a framework that draws on two existing academic disciplines: instructional science and information studies. Instructional science is the study of learning theory, cognition, and interactive learning systems. Information science is the study of information access, retrieval, processing, and distribution (Maule, 1998, p. 177). His proposed Internet Studies curriculum contains foundation courses in both instructional science and information science:

- Cognitive science and learning theory
- Artificial intelligence
- Information representation
- Human-machine interactive process
- Distributed and virtual knowledge
- Information presentation
- Information and societal factors

Can we imagine an IT curriculum that addresses the unique needs of preparing instructional technologists to use the Web in curricular and instructional development?

Web Design and the IT Curriculum

As the Web takes on increasing importance, it is reasonable to expect IT programs to increase their offerings in Web-related courses. Skilled designers of any sort draw on a variety of skills that are difficult to describe. Design takes place through what Schön (1983) describes as "reflection-in-action": the reflective activity that characterizes the special knowledge of the skilled practitioner. Tripp (1994) notes the complex, ill-structured nature of design activities and the consequent difficulty of teaching design. He suggests that instructional design be taught in a manner similar to the way in which art and architecture are taught. Just as students of these disciplines learn by examining and discussing examples of great art and architecture, students of instructional design should study examples of great instructional design. Students could also learn instructional design in studio courses, in which students, professors, and design experts collaboratively design and critique instructional projects. This model could effectively be used to train students in Web design skills. In keeping with the mix of theory and practical skills suggested above, I propose the following areas of study be included in IT program course offerings:

- Web design methodologies
- Web design and presentation technologies
- Project management skills: planning, scheduling, and tracking of resources; communication skills; team building
- Web design theory: information theory and information design, cognition and perception, hypertext/hypermedia theory, the social construction of knowledge
- Critical pedagogy (Shor & Freire, 1987) and the analysis of Web content: Teach students a critical stance toward content. Whose interests are represented on the Web? Whose knowledge is presented in Web-based instruction? How can Web design be a liberatory experience for both learner and teacher?

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Note: This paper summarizes a more detailed discussion. For the complete paper, refer to http://www.svictor.com/itcurr.pdf.

An Instructional Design for Elementary Science- A Product of Current Education Reform in Taiwan

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In Taiwan, a brand new national curriculum standard entitled "Grades 1-9 Curriculum Guideline Framework" was published in 1998 by the Ministry of Education, which has features of integrated, school-based curriculum, emphasis on information and technology. The framework proposes the educational goals with 10 key competencies and claimed that new education standard has been executed in schools from grade 1 to 9 by 2001. It did stir up the primary and junior high school teachers and publishers as well. The current education reform is somewhat a revolutionary event among science education community because it brought complex and compact changes of curriculum development as well as various teaching and learning styles and strategies.

The author leads a team of elementary inservice science teachers to work on the new standard and to develop standard-based teaching materials that been try-out taught. The purpose of this report is to present an instructional design of "The Moon" and "Stars" for grade school, which developed and based on the goals of ten competencies and the features of new standard. This report is an example of our product of the past working year and sharing for international understanding. These resources will be linked in WWW for inservice teachers to offer professional growth (temporary home page: www.scitec.ntptc.edu.tw).

The Modules of "the Moon":

Lesson I: Folktales and Celebrations

Objectives: (1) Be able to collect various folktales and the way of their celebrations of the festivals about the moon through web or books in the library. (2)To know Chinese lunar calendar and festivals.

Descriptions: (1) Pre-request the students to use internet (or library) to collect legends about the moon. (2)Ask students to share their stories collected, particularly Chinese folktales. (3) Students look up the lunar calendar and record all the festivals based on the calendar. (4)Invite students to draw a picture of the moon's surface. (5) Invite students to write a story after viewing the surface of the moon, and share their own stories.

Lesson II: Let's travel to the Moon.

Objectives: (1) To know the America's Apollo project. (2) To know physical condition of the moon. (3) To know how spacesuit, spaceship and astronaut works.
(5) To learn the skills of solve problems. (6) To learn social skills.

Descriptions: (1) Ask students to present (a) the Apollo Project. (b) Who is the first astronaut who stepped on the moon? (c) What Armstrong said when he stepped out of the spaceship? (2) Discuss what did astronaut find or not find on the surface of the moon. (3)Lead group work on following items to see how they work: (a)Spacesuit (b) spaceship (c) Rocket (d) astronaut (e) Astronaut's living in spaceship. (4) Design a colony on the moon, try to solve the following problems: (a) How to keep people alive without air? (b) How to protect them from space rays, extreme cold and hot? (c) How to supply food without agricultural? (e) How to travel and communicate? (5) Draw a picture of community on the moon.

Lesson III: A Hound Bites the Moon?

Objectives: (a) To change misconception about lunar phases or eclipses. (b)To recognize the sequence of lunar phases. (c)To predict the lunar date according to lunar phases.

Descriptions: (1) Telling the Chinese folktale of "a hound bites the moon." And students judge the possibilities of it. (2) Showing a table of lunar date vs lunar eclipse, allow students to be aware that eclipse occurs when it is full moon. (4) Having 3 students to play roles of the earth circling the sun (light) and the moon evolving the earth. (5) Students will find out that the earth's shadow will cover the moon. This is the cause of eclipse. (insert a picture) (6) Teacher draw pictures of lunar eclipse, and students demonstrate the lunar eclipse using paper model. (7) Having 4 students act as 4 positions of the moon orbiting the earth all facing toward the sun. One additional student plays the role of the earth at the center. The students will

realize the cause of lunar phase. (insert a photo picture of students' role-playing)

Lesson IV: Lunar Tides

Objectives: (1) To know the cause of the tide. (2) To predict the high or low tide hour at certain coast around Taiwan. (3) To recognize the high and low tide match the lunar phases.

Descriptions: (1)Teacher illustrates Newton's finding about gravity. (2)Teacher guides students to be aware that tide is caused by moon's gravity. (3)Teacher illustrates that there are twice flow and ebb tides per day while the earth spins. (4)Teacher illustrates that there are twice highest and lowest tides per lunar month while the moon evolves around the earth. (5)Ask student to collect data through internet or *Taiwan Astronomy Year Book* about high tide hours within one day around Taiwan's coast. (6)Ask student to read the book of *Taiwan Astronomy Year Book.* The students will find that high tide and low tide match lunar calendar, e.g., high tide is on full moon and new moon days as well.

Modules of "The Star"

Lesson 1: What Birth Sign of Constellation You Are?

Objectives: (1)To find the pattern of constellations. (2) To know some myth stories of constellations. (3)To create students' own constellations. (4) To write a creative story about a constellations.

Descriptions: (1) Teacher shows the birth sign of constellation, and asks students to tell his/her own sign. (2) Ask why and how the birth sign of constellation named. The students shall notice that the picture of imagine of constellation. (3) Divide students into groups according to the birth constellations, and discuss the stars in their own birth constellations. Doing so, students will find patterns in the sky. (4) Present the Chinese folktales of "The Lovers of Vega and Altair." and Greek's mythical stories about constellations. (5) Distribute fluoresce star stickers; students stick them on a dark room, so that students can see shinny stars, constellations in a black paper.

Lesson II: How to Find a Star and Name It?

Objectives: (1) To collective data about stars using internet. (2)Be able to use paper "star chart disk." practicing how to find a star. (3) To know the star "move" counterclockwise when observe it.

Descriptions: (1) Pre-request student to collect data about birth constellation from web, includes verbal descriptions and pictures. Students share their findings. (2) Distribute paper "star chart disk" to each student. Teaches student how to find a star from the chart (3) Go out in night and find the star from correct angle of elevation and direction indicated on the chart. (4) Find a star and name it in the dark sky guided with the chart.

Lesson III: Let's Plan a Trip to an Astronomical Observatory or Field in Night

Objectives: (1)To acquire ability of planning, organizing and practicing. (2)To learn cooperatively work with others.

Descriptions: (1) Teacher proposes a field trip to an astronomical observatory/field. The students should work as leader, reminder, data collector, expense manager, and discuss how they cooperatively work as a group.

Lesson IV: Let's Go Out to Observe the Stars

Objectives: (1) To recognize a star in the dark sky. (2) To compare the brightness of stars. (3) To learn the social skills.

Descriptions: (1) Gathering students in a dark field. (2) Teacher assigns the Polaris/Big Dipper and ask student to identify it in the dark sky. (3) The students use the chart to help finding the angle of elevation and direct of Polaris/Big Dipper.

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The New Opportunities Fund 'ICT for Teachers' Initiative, in the UK and the SIfT 'Virtual Tutor' Model

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Abstract
SIfT, as an Approved Training Provider to the Government New Opportunities Fund, 'ICT for Teachers' initiative in the UK, has created a highly structured model for designing and delivering course materials to remote teachers, via a Virtual Learning Environment. Based on the face to face delivery model and Gagné's (1985) nine events of instruction, it incorporates the qualities of the 'virtual tutor' in pedagogically sound materials (TTA 2001). With SIfT training accessed via the Internet, the international aspects of delivering training for teachers by this medium are continuing. SIfT materials are currently being used by in excess of 1000 teachers, in England, Jersey and Germany and have been trialled in Norway.

Introduction

Staffordshire ICT for Teachers (SIfT), a collaboration between Staffordshire University and Staffordshire Local Education Authority (LEA), in the U.K, is a Government Approved Training Provider, to the New Opportunities Fund, 'ICT for Teachers' initiative (NOF 2001). This UK Government scheme, which commenced in April 1999, provides a sum of money for every 'serving' teacher in the UK to 'buy' professional development training in ICT (Information and Communications Technology), from Government approved trainers. SIfT (1999) was approved as a national provider, following a competitive tendering process, to deliver ICT training to secondary teachers (of students aged 11-18), within the subjects of geography and design and technology.

SIfT delivers highly innovative training materials for secondary teachers, directly into their working environment using a web-based Virtual Learning Environment (VLE), in this instance Lotus Learning Space. A VLE is defined as "*an integrated software system, which combines within a package facilities for the delivery of learning materials, communication (synchronous or asynchronous), assessment and student feedback*" (LTSN/THES 2001).

The SIfT 'Virtual Tutor' Model

SIfT, through action research, has created a highly structured model for designing and delivering course materials to remote teachers, through a Virtual Learning Environment. The model is based on delivering *'learning on demand'* training, which is highly subject focused to the user requirements and which is developed to a structure which teachers are able to conceptualise. The model also provides a template for the development of clear 'bite-sized' pieces of learning, which incorporate qualities of the *'virtual tutor'*, delivered through the technology (Whitehouse *et al.* 2002).

In a face to face training environment, the able tutor will incorporate their own personality and style to the delivery of their materials. They will not only include delivery of the key messages, but will also incorporate humour and will provide scenarios and examples to context ualise the subject matter. They will reiterate material to accentuate importance, will judge the understanding of the audience and will re-visit areas of difficulty if not understood, adopting a different emphasis or slant to aid understanding. They may ask questions of the audience, even if no response is expected, to encourage each participant to think and individualise their own response, or answers may be requested, in order to draw the learner into the process and clarify understanding.

The role of the face to face tutor though goes further in developing and supporting the learner, offering references for background reading, providing hand outs, answering questions, supporting requests from the learner in the form of guidance and ideas and ultimately offering formative and summative feedback to assignments.

Gagné (1985) identifies nine events of instruction for any desired learning, (see Table 1). These instructional events provide the external conditions that are necessary for learning to take place; the events usually occur in the order listed. Within the SIfT Coursework materials, qualities of the face to face tutor and Gagné's nine events of instruction are developed and incorporated within the 'virtual tutor' model, through innovative use of the interactive facilities that the technology provides.

1.	Gaining attention.
2.	Informing the learner of the lesson objective.
3.	Stimulating the recall of prior learning.
4.	Presenting the stimulus material with distinctive features.
5.	Providing learning guidance.
6.	Eliciting performance.
7.	Providing information feedback.
8.	Assessing performance.
9.	Enhancing retention and learning transfer.

Table 1: Gagné's nine events of instruction

SIfT's highly subject specific ICT training for teachers, is based on a 12 Unit grid, consisting of four subject strands, each with three levels of ICT capability - beginner, intermediate and advanced. The extensive multimedia material is innovative, lively, interactive and dynamic, with special emphasis being placed on understanding and accommodating the many requirements of teachers' daily needs. The materials have been created for teachers, by teachers (Whitehouse *et al.* 2002).

Teachers are given stimulus ideas within the SIfT units and are supported with tutorials in teaching and learning and ICT skills. The teachers then implement their ideas as part of their assignment, in a way that is relevant to them within their school – usually in planning an appropriate piece of teaching and learning. They have access to an on-line mentor. The teachers get advice on how to improve their lesson assignments submitted. The product of their work goes into the on-line library of the VLE course room, to build the resource base for others, with individuals able to download and use other teachers' endeavours. Discussion facilities and student profile areas are also provided.

Conclusion

The impact of SIfT provision, under the New Opportunities Fund, 'ICT for Teachers' initiative, cannot be underestimated. The 'virtual tutor' model has enabled teachers to be engaged in mass on-line training, which is highly targeted and meets teachers' needs for semi-negotiated professional development. The Teacher Training Agency (2001) said of SIfT *"The model is actively chosen by schools, mainly because of it's subject specific nature and networking potential...The material and structure of the training can facilitate the development of significantly advanced pedagogical thinking and extend the use of ICT within the school."* A library of resources has been created and is continually being updated facilitated by SIfT– reinventing networking between ordinary classroom teachers on a national and international, rather than on a local scale.

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Designing a Web-based Curriculum for Middle School Students

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Abstract: This paper addresses the implications for designing instruction for delivery over the Internet. A small education company in the southern United States has developed a unique Web-based middle school program that incorporates multimedia to deliver instruction in the context of a problem-based scenario. Specifically, this paper outlines a theoretical perspective for the development of on-line education, discusses one company's approach, and outlines some initial qualitative feedback from students.

Introduction

In recent years an increasing number of schools have made large investments to bring computers and Internet access into the classroom. With this technology, there is both opportunity and controversy as educators seek ways to integrate these innovations into classroom instruction. Much of this debate has addressed whether the pedagogical foundation of instruction changes when components of the class can be delivered via the Internet. Curriculum that was originally designed for the traditional setting is afforded different instructional activities and learning opportunities that were not perceived or even possible before Web-based instruction (Dabbagh & Schmitt, 1999).

Theoretical Perspective

Many organizations have moved toward constructivism as the foundation for the development of their instructional program, but there is a great deal of variety in what people mean when they say they are constructivist. Some of this can be accounted for by the differences in the theories on which constructivism is based. In general, most constructivists agree on three broad principles (Dalgarno, 2001):

- People form their own unique representations of knowledge.
- Learning occurs when people uncover an inconsistency between a new experience and their current representation of knowledge.
- Learning occurs within a social context (Vygotsky, 1978).

Although there is agreement on these broad ideals, different organizations emphasize them in different ways. For example, an individual manipulating objects on the computer screen emphasizes the second principle whereas collaborative learning using computer-mediated communication is based on Vygotsky's theory. Both activities can be considered constructivist (Dalgarno, 2001).

The movement toward a brain-based curriculum has also taken precedence in recent years, focusing on an integration of both constructivist and cognitive learning theories (Bruer, 1999). Brained-based learning is a progressive movement in education that seeks to recognize the strengths each individual brings to the classroom while supporting students as they overcome their weaknesses. Instruction from this perspective emphasizes that as students improve their underlying cognitive skills and memory levels their ability to learn is enhanced. This creates a strong foundation for the development of higher-order thinking skills (Kuyper-Erland, 1999). Effective instruction should help students learn to self-monitor their performance, reflect on their progress, and use forethought in making decisions about future learning experiences. This promotes a sense of self-efficacy and motivates students to become better learners. In addition, when information is presented in a variety of different formats students learn to recognize the similarities and differences between types of information.

A multi-modal approach also provides for individual differences based on variations in students' learning strengths. Traditional education has placed emphasis on some types of cognition over others (Gardner, 1986). This one size fits all approach to education means that some learners may be disadvantaged if their cognitive strengths fall into areas that are not traditionally addressed by educators (Driscoll, 1994).

Components of the System

The curriculum under study has been designed to meet the needs of middle school students. Informal research conducted by the company revealed that although there is a great deal of computer based instruction for use in the elementary school, there is little being developed specifically for middle school students. In fact, it has been argued that the middle school years coincide with the most critical period in adolescent development, and yet it is the least understood age group in our society (Hurd, 2000). Consequently, there is a need for a clearer vision of what a middle school curriculum should address.

From the perspective of cognitive psychology, key instructional strategies have been implemented into the learning system (Driscoll, 1994). Students are able to manipulate information in a variety of ways, which enhances understanding and facilitates long-term retention. Each topic is covered using a variety of multimedia that presents information in different modalities. This further facilitates retention and helps students see relationships among important concepts. Students choose their own learning pathway, increasing motivation and the depth of learning. The students have the freedom to explore new ideas and test their assumptions without the fear of failure that often hinders learning.

The company has developed an on-line system for the delivery of the curriculum. Although the content varies according to the course, there are common elements students use including:

- Problem-based scenarios
- Content according to each student's unique learning strengths.
- Software that allows students to build an on-line presentation.
- An on-line quiz and testing feature.

Currently, the system is implemented in 14 schools across the United States in a variety of settings with differences in both physical environment and socio-economic status. Early qualitative reports from students indicate an overall favorable impression of the system, but continued research will help validate its use and effectives for middle school students.

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